

adult; first rays of dorsal and anal filamentous, exceedingly long, in the young much longer than body, becoming somewhat shorter with age; lateral line with a wide arch, its summit under origin of dorsal, the chord of the curved portion about equal to straight part; scutes not strong, weak in the young; sheath of dorsal and anal fins little developed; ventrals moderate, about 2 in head; pectoral long, falcate, its length exceeding that of head, its tip reaching vertical of tenth anal ray.

Color in alcohol, bluish above, silvery on sides and below; head and middle of side with some yellow; a large dark blotch on opercle, a black blotch on orbit above; fins all pale, a large black blotch on base of the fourth to eighth dorsal rays, a smaller one on third and fourth anal rays; first 2 or 3 produced dorsal filaments pale, next 3 or 4 black for most of their length; ventrals dusky. The above description based chiefly upon a specimen (No. 4039) 15 inches long from Honolulu.

A specimen 4.6 inches long, also from Honolulu, had in life 3 curved transverse bands on side of body, convex anteriorly, 1 on caudal peduncle, an indistinct trace of another in front of the 3, the most distinct one extending from just behind dorsal angle of body to just behind ventral angle; the next from about middle of soft dorsal to middle of soft anal; these 3 bands somewhat dusky above and showing very distinct when held at certain angles, but less so when held at others; black spot near

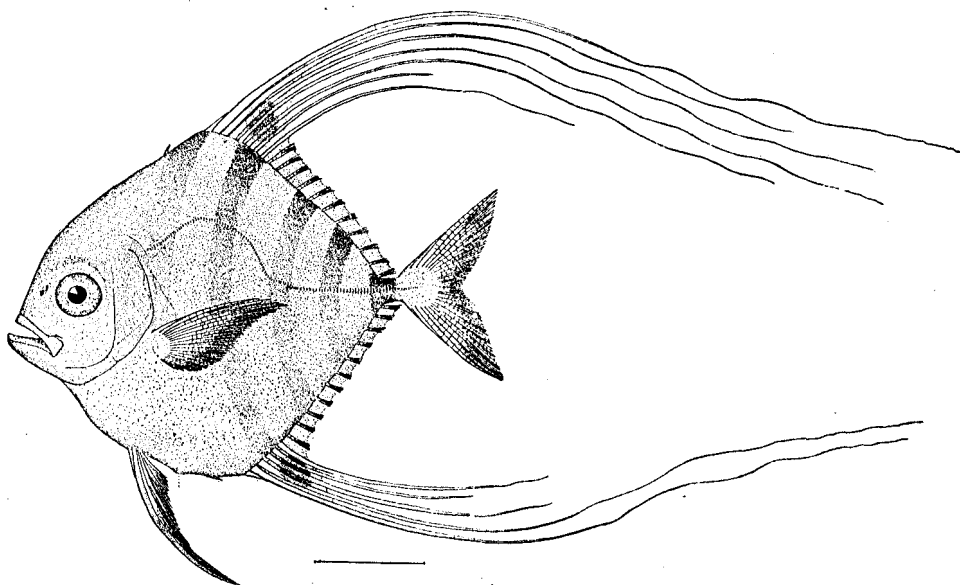


FIG. 78.—*Alectis ciliaris* (Bloch).

base on highest portion of dorsal; ventrals dusky for two-thirds their length; upper margin of opercle black; anterior dorsal and anal filaments white, the next ones black.

This interesting and beautiful fish is of wide distribution, being found on both coasts of tropical America, ranging northward to Cape Cod and Mazatlan. It is generally common southward, especially about Cuba and the Florida Keys. The many nominal species have been reduced by Lütken to 3 or 4—*gallus* and *ciliaris* of the East Indies, *alexandrinus* of North Africa, and *crinitus* of America. We have not examined the East Indian forms, but we see no reason for doubting that *ciliaris* is the young of *gallus*, as has been supposed by Dr. Day and others. The name *gallus* was, however, originally applied by Linnaeus to *Selene vomer*. Our young examples of *crinitus*, moreover, agree fully with the figures of *ciliaris*. We think it therefore extremely probable that all the nominal species of this type are forms of *Alectis ciliaris*. As has been shown by Lütken (*Spolia Atlantica*, 197), the nominal genera *Seyris*, *Blepharis*, and *Gallichthys*, are simply stages in the development of individuals, the characters assigned to these genera changing with age.

The species seems to be not uncommon among the Hawaiian Islands. It was obtained by Dr. Jenkins in 1889, and our collection contains a fine series of examples, ranging in length from 4 to 15.5 inches. The *Albatross* obtained specimens at Honolulu and at Hanalei Bay, Kauai.

- Zeus gallus* Bloch, Ichth., VI, 29, pl. CXCVI, fig. 1, 1788; not of Linnaeus, locality not given.
- Zeus ciliaris* Bloch, Ichth., VI, 27, pl. 191, 1788, East Indies.
- Scomber filamentosus* Mungo Park, Trans. Linn. Soc. London, III, 1797, 36, Sumatra.
- Gallus virescens* Lacépède, Hist. Nat. Poiss., IV, 583, 1802, locality not given; after Linnaeus.
- Seyris indica* Rüppell, Atl. Fische, Fische des rothen Meeres, 128, taf. 33, fig. 1, 1828, Djetta; Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 145, pl. 252, 1833 (Pondicherry and Java); Rüppell, Neue Wirbelt., Fische, 51, 1838; Richardson, Ichth. China, 276, 1846 (Canton).
- Blepharis fasciatus* Rüppell, Atf. Reis. Nordl. Af., 129, pl. 33, fig. 2, 1828.
- Gallichthys chevola* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 175, 1833; after Russell.
- Gallichthys major* Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 168, pl. 254, 1833 India; Richardson, Ichth. China, 271, 1846 (China Seas); Cantor, Cat. Malayan Fishes, 136, 1850 (Sea of Pinang, Singapore).
- Seyris ruppellii* Swainson, Class. Fish., II, 251, 1839, locality not given.
- Seyris indicus*, Cantor, Cat. Malayan Fishes, 134, 1850 (Sea of Pinang).
- Carangoides blepharis* Bleeker, Verh. Bat. Gen., XXIV, 1852, 67, Batavia.
- Carangoides gallichthys* Bleeker, Verh. Bat. Gen., XXIV, 1852, 68, East Indies.
- Caranx gallus*, Günther, Cat., II, 455, 1860 (Malay Peninsula, China, Java); Günther, Fische der Südsee, V, 135, 1876 (Hawaiian and Society islands); Day, Fishes of India, II, 224, Pl. LI, fig. 3, 1876.
- Caranx ciliaris*, Günther, Cat., II, 454, 1860 (Amboyna; India); Günther, Fische der Südsee, V, 135, pl. 89, 1876 (Pelew, Kingsmill, Sandwich, and Solomon islands).
- Seyris gallus*, Klunzinger, Fische des rothen Meeres, I, 101, 1884.
- Seyris ciliaris*, Klunzinger, l. c. (Red Sea).
- Alectis ciliaris*, Jordan & Evermann, Fish. North & Mid. Amer., I, 931, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 308, 1902; Jordan & Evermann, Proc. U. S. Nat. Mus., XXV, 1902, 338 (Kerum, Formosa); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 447 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 525 (Honolulu; Hanalei Bay, Kauai).

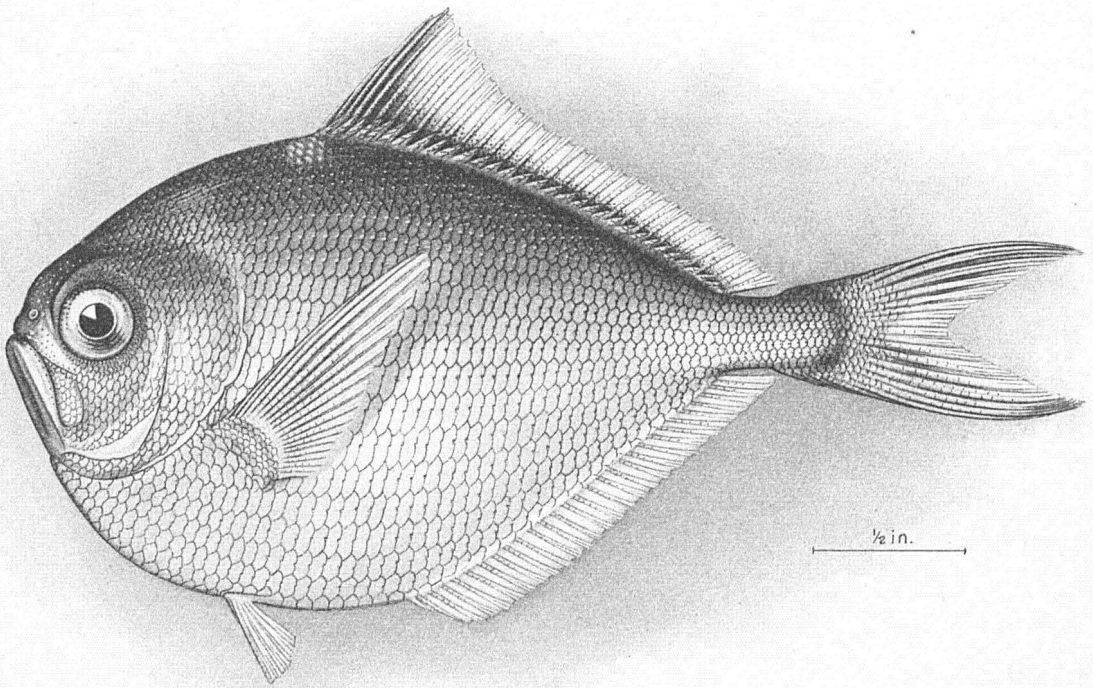
Family LVI. BRAMIDÆ.—The Pomfrcts.

Body oblong, more or less elevated, strongly compressed, covered with firm adherent scales, large or small; scales firm, cycloid, lobate, or emarginate, or with a median ridge or spine, this character found in the young of all species but disappearing with age in some of them. Mouth moderate, very oblique, maxillary broad and scaly, premaxillary protractile; jaws with bands of slender teeth; vomer and palatine teeth present or absent; preopercle entire or serrulate, serrate or spinous in the young; opercles well developed; dorsal and anal fins long, similar to each other, each with 3 or 4 anterior rays short and simple, developed as spines, the remaining rays all articulated; soft dorsal and anal scaly or with a sheath of scales; ventrals small, below the pectoral; axillary scale well developed, the rays 1, 5; pectoral long; caudal peduncle slender, the fin lunate or forked, sometimes widely so; branchiostegals 7; pseudobranchiæ present; pyloric cæca few; air-bladder present or absent; supraoccipital crest large and high, extending forward to the snout; vertebrae numerous (16+23=39 in *Brama raii*); skeleton firm; shoulder-girdle thick and heavy, the hypocoracoid especially large and much dilated, entering the ventral outline, excluding the pubic bones from contact with the shoulder-girdle; pubic bones short and small; neurals and interneurals small and slender. Fishes of the open sea, widely distributed and often inhabiting considerable depths, subject to great changes with age.

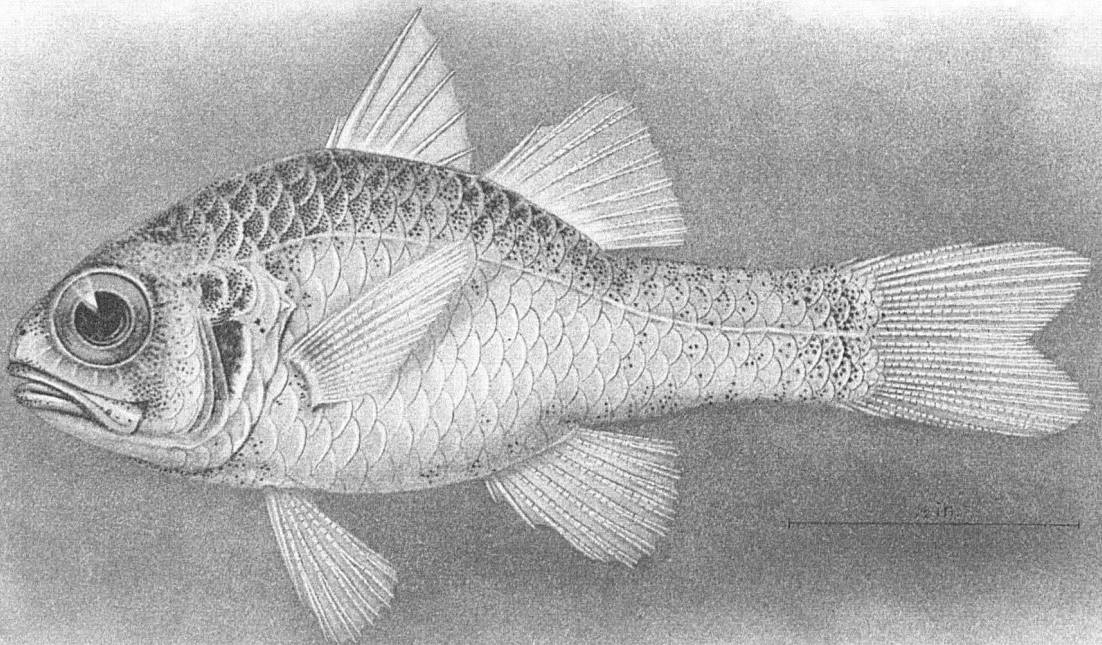
Genus 116. COLLYBUS Snyder.

Body deep, ovate, greatly compressed; teeth in narrow bands, about 2 or 3 rows on jaws, none on vomer or palatines; 2 small fangs on each side of lower jaw near tip; teeth all small, weak, sharply pointed; gillrakers long and slender; pseudobranchiæ large; pyloric cæca 4, 2 of them about equal in length to diameter of pupil, the others nearly as long as stomach; vertebrae 38; mouth very oblique, nearly vertical; opercle, subopercle, interopercle, and preopercle smooth; scales short, very broad (vertically), the upper and lower edges sharply pointed, strongly ctenoid, each scale with a median, thickened, vertical ridge having a conspicuous tubercle in the center; number of scales in a lateral row between opercle and base of caudal about 50; no lateral line; dorsal inserted on a vertical passing just behind base of ventral, rays 34, the anterior 3 or 4 without articulations; anal 30, a row of scales along base of fin; caudal deeply forked; ventral inserted on a vertical through posterior half of base of pectoral.

Color silvery, dusky on head and back.



1. COLLYBUS DRACHME SNYDER.



2. AOGON ERYTHRINUS SNYDER.

The genus *Collybus* differs from *Taractes* in not having teeth on the vomer and palatine bones, in having the caudal deeply cleft, the ventrals inserted posterior to the middle of the bases of pectorals, and in not having the opercular bones denticulated.

Collybus Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 525 (*drachme*).

156. *Collybus drachme* Snyder. Plate 34, fig. 1.

Head, measured to end of opercular flap, 3.3 in length (snout to base of caudal); depth 1.7; depth of caudal peduncle 3.6 in head; eye 2.8; snout 4.9; maxillary 2.2; interorbital space 3.3; D. 34; A. 30; scales in lateral series 51,—19.

Body greatly compressed, its width at the widest part equal to length of maxillary; upper contour rather evenly curved from snout to caudal peduncle; lower contour much more convex, the base of anal not curved; mouth nearly vertical; lower jaw projecting somewhat beyond upper, posterior edge of maxillary reaching a vertical through anterior edge of pupil; teeth small, weak, sharply pointed, in narrow bands (2 or 3 rows) on jaws; 2 larger, fang-like teeth on each side of tip of lower jaw; no teeth on vomer and palatines; pseudobranchiae large, the filaments equal in length to twice diameter of pupil; gillrakers 4+10, slender, long, and sharply pointed; edges of opercle, interopercle, subopercle, and preopercle smooth; lower jaw, snout, and interorbital area naked; other parts of head, including the maxillary and the body, closely scaled; scales strongly ctenoid, the ridges with minute tubercles; each scale with a high vertical ridge, on the middle of which is a prominent knob; the ridges of the scales hidden by the overlapping softer parts, the knobs projecting, lying in longitudinal rows; scales short, but very broad vertically, the upper and lower edges sharply pointed; scales of head, at base of pectoral and along the back much smaller than the others; no evident lateral line.

Dorsal inserted on a vertical passing behind base of pectoral a distance equal to diameter of pupil, rays 34, the anterior 3 or 4 without articulations; fin elevated anteriorly, the longest ray 1.4 in head; posterior rays 3.6. Anal rays, except first 1 or 2, articulated; length of anterior rays 3.6 of head; caudal deeply forked; pectoral pointed 3.2 of the length; ventrals inserted on a vertical passing through posterior half of base of pectoral.

Color bright silvery, dusky on upper part of head and along back; a silvery spot about the size of pupil at insertion of dorsal; upper and lower rays of caudal dusky; central part yellowish white; anterior rays of dorsal dusky.

The type, No. 50875, U. S. Nat. Mus., is a specimen 6 inches long, from station 4176, off Niihau, evidently near the surface. Other examples, among which are cotypes, 7737 L. S. Jr. Univ. Mus., were obtained from the stomach of a *Coryphæna* at Honolulu. Small squids and fishes were taken from the stomach of the specimen here described. A specimen seen in the Bishop Museum.

Collybus drachme Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 525, pl. 9, fig. 16, Albatross Station, 4176, off Niihau.

Family LVII. CORYPHÆNIDÆ.—The Dolphins.

Body elongate, compressed, covered with small cycloid scales; cleft of the mouth wide, oblique, the lower jaw projecting; cardiform teeth in the jaws and on the vomer and palatines; a patch of villiform teeth on tongue; no teeth in esophagus; opercular bones entire; skull with a crest which is much more elevated in adult than in young; a single, many-rayed dorsal fin, not greatly elevated, extending from nape nearly to caudal fin; anal similar, but shorter, each without distinct spines; pectoral very short and small; ventrals well developed, thoracic, 1, 5, partly received into a groove in the abdomen; caudal fin widely forked; lateral line present; gill-membranes free from isthmus; branchiostegals 7; no pseudobranchiae; no air-bladder; pyloric appendages very numerous; vertebrae about 30. A single genus with probably but 2 species. Very large fishes inhabiting the high seas in warm regions, noted for their brilliant and changeable colors.

Genus 117. CORYPHÆNA Linnæus.

Characters of the genus included above. The species are not well known, having been unduly multiplied by authors. According to Dr. Lütken they are probably reducible to 2; both known to occur among the Hawaiian Islands.

Coryphæna Linnæus Syst. Nat., Ed. X, 261, 1758 (*hippurus*).

Carcinomorax Lacépède, Hist. Nat. Poiss., 111, 82, 1802 (*pelagicus*).

Lepimphis Rafinesque, Caratteri, 33, 1810 (*hippuroides*).

Lampagus Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 317, 1833 (*pelagicus*; young).

a. Dorsal rays 55 to 65; anal 26 to 30; adult with the front greatly elevated, forming a high crest.....*hippurus*, p. 204

aa. Dorsal rays 51 to 55; anal 24 to 26; profile of adult male not very steep and not very different from that of female.

equisetis, p. 205

157. *Coryphæna hippurus* Linnæus. Common Dolphin. "*Mahiki*;" "*Māhimāhi*." Fig. 79.

Head 4.35 in length; depth 5; eye 6.2 in head; snout 3; interorbital 3; maxillary 2.1; D. 57; A. 27.

Body long and slender, deepest anteriorly; anterior profile in adult male nearly vertical; maxillary reaching posterior edge of pupil; mouth large, horizontal; bands of teeth on jaws, vomer, tongue, and palatines, the teeth all recurved, those in outer row larger, being wide-set, sharp, and conic; tongue rounded, free; eye low, anterior; a horizontal groove from eye to nostril; origin of dorsal over middle of eye in adult male, its tips extending to rudimentary rays of caudal, the twelfth or thirteenth ray being the highest; origin of anal nearer posterior edge of eye than base of caudal; ventrals inserted slightly behind upper base of pectoral, 1.25 in head; pectoral 1.35.

Color in alcohol, bluish silvery above, lighter below, becoming white on belly; the sides, chiefly below lateral line, with many dark spots about size of pupil, these most numerous anteriorly; dorsal

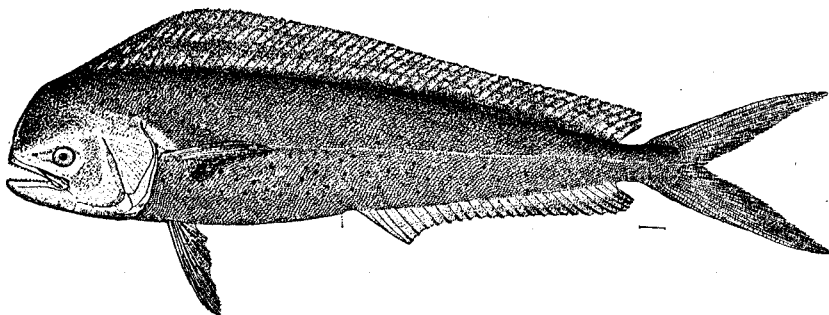


FIG. 79.—*Coryphæna hippurus* Linnæus; after Jordan and Evermann.

fin dull purplish black; other fins color of corresponding parts of body except ventrals, which are dull purplish black on inner side; anal dull purplish on outer edge; peritoneum grayish black.

This description is from a specimen (No. 04450) 29.5 inches long, from Honolulu. Numerous other examples were seen by us and several were preserved. One from Hilo, when fresh, had the lower half of body yellowish; blue spots under pectorals; jet black spots all over the rest of the lower side, upper portion bluish with dark spots on silvery bluish ground; dorsal fin bright ultramarine blue; belly light; anal tinged with blue. The color of this fish in life is indescribably beautiful, but it undergoes very rapid changes while dying. After death only faint indications of the former colors remain. Our several specimens are 29 to 46 inches in length, from the largest of which the following measurements were secured:

	Inches.
Length of fish to end of cleft of caudal fin	46
Root of caudal to end of cleft	4.25
Body exclusive of head	33.25
Trunk	13.5
Height of dorsal	8.0
Height of anal	5.25
Height of ventral	7.75
Height of pectoral	7.5
Depth of body at vent	8.0
Caudal peduncle	2.5

Coryphæna hippurus Linnæus, Syst. Nat., Ed. X, 261, 1758, **open seas**; Günther, Cat., II, 405, 1860; Günther, Fische der Südsee, V, 146, 1876 (Indian Ocean); Jordan & Evermann, Fishes North and Mid. Amer., I, 952, pl. 149, fig. 402, 1896; ibid., Amer. Food and Game Fishes, 324, with fig., 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 447 (Honolulu.)

- Scomber pelagicus* Linnaeus, Syst. Nat., Ed. X, 299, 1758, no locality given.
Coryphæna fasciatus Pallas, Spicil. Zool., VIII, pl. 3, fig. 2, 1772, Amboyna.
Coryphæna chrysurus Lacépède, Hist. Nat. Poiss., III, 186, 1800, Pacific Ocean.
Coryphæna imperialis Rafinesque, Caratteri, 33, 1810, Sicily.
Lepimphis hippuroides Rafinesque, Caratteri, 34, 1810, Palermo.
Coryphæna immaculata Agassiz in Spix, Pisc. Bras., III, pl. 56, 1829, Atlantic, off Brazil.
Coryphæna margravii Cuvier & Valenciennes, Hist. Nat. Poiss., IX, 301, 1833, America.
Coryphæna sucreei Cuvier & Valenciennes, op. cit., IX, 302, 1833, Philadelphia.
Coryphæna dorado Cuvier & Valenciennes, op. cit., IX, 303, 1833, Brazil.
Coryphæna dollfus Cuvier & Valenciennes, op. cit., IX, 305, 1833, Antilles.
Coryphæna virgata Cuvier & Valenciennes, op. cit., IX, 308, 1833, Martinique.
Coryphæna argyrurus Cuvier & Valenciennes, op. cit., IX, 314, 1833, sea of Coromandel.
Coryphæna vlamingii Cuvier & Valenciennes, op. cit., IX, 315, 1833, seas of India.
Coryphæna scomberoides Cuvier & Valenciennes, op. cit., IX, 315, 1833, South Sea.
Lampagus sicutus Cuvier & Valenciennes, op. cit., IX, 323, 1833, Sicily.
Coryphæna japonica Schlegel, Fauna Japon., Poiss., 120, pl. 64, 1845, Japan.

158. *Coryphæna equisetis* Linnaeus. Small Dolphin. Fig. 80.

Head 4.2 to 4.6 in length; depth 3.6 to 4; D. 51 to 55; A. 24 to 26; vertebrae 33; profile of head convex, but not nearly vertical, even in the adult; maxillary reaching front of pupil, 3.8 to 4.8 in head; insertion of dorsal behind eye; pectorals equal to half length of head; maxillary reaching middle of eye; profile of snout becoming nearly vertical with age; front of anal under middle of body. Colors brilliant in life, changing suddenly at death; brownish olive above, white or golden below, with bright-blue spots, which are largest on the back and head, forming bands on snout; dorsal purplish blue, with paler

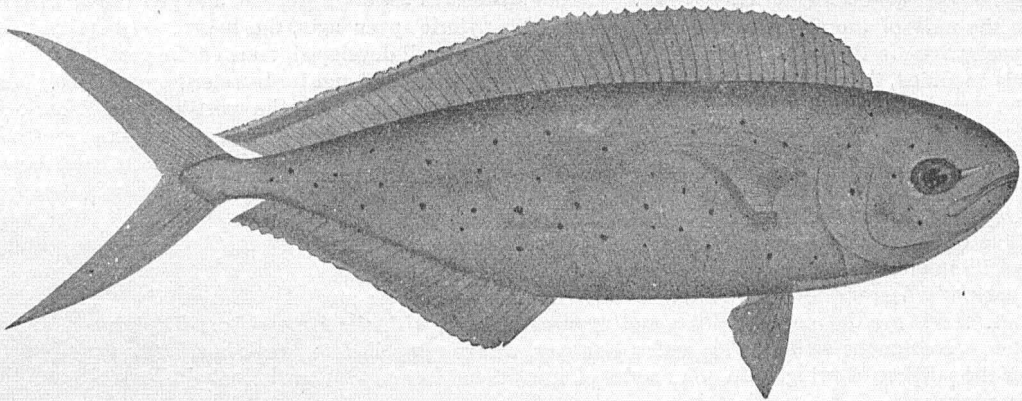


FIG. 80.—*Coryphæna equisetus* Linnaeus; after Günther.

oblique lines, other fins tinged with blue; caudal yellow; in spirits pale, with blackish spots on the lower parts.

“Male with the front elevated, forming a crest, which projects a little beyond the upper jaw; female with blue spots along each side of tail, regularly arranged.” (Poey.) Length 30 inches. Open Atlantic; rare in the West Indies; not recorded from coast of the United States.

Recorded by Bennett from the vicinity of Laysan (latitude 27° N., longitude 166° W.) and by Günther from between Tahiti and the Hawaiian Islands.

We are not sure that the specimens recorded by Bennett and by Günther were not the common species, *C. hippurus*, but the few dorsal rays in Günther's figure and his positive identification indicate that this species as well as the other occurs there. The position of the origin of the dorsal fin, however, is not, as Günther has thought, an important character, as it varies greatly with age, being much more anterior in the young than in the adult.

This species was not seen by us among the Hawaiian Islands.

- Coryphæna equisetis* Linnaeus, Syst. Nat., Ed. X, 261, 1758 (misprinted *equisetis*), high seas; Günther, Cat., II, 407, 1860 (Atlantic); Günther, Fische der Sudsee, V, 147, pl. 93, Fig. A, 1876 (between Tahiti and Hawaiian Islands); Jordan & Evermann, Fishes North and Mid. Amer., I, 953, 1896; Jordan & Evermann, Amer. Food and Game Fishes, 325, 1902.
Coryphæna socialis Bennett, Narrative Whaling Voyage, II, 274, 1840, latitude 27° N., longitude 166° W.

Group PERCOIDEA.—The Perch-like Fishes.

A group of fishes of diverse habits and forms, but on the whole representing better than any other the typical *Acanthopterygian* fish. The group is incapable of concise definition, or, in general, of any definition at all; still, most of its members are definitely related to each other, and bear in one way or another a resemblance to the typical form, the perch, or more strictly to its marine relatives, the sea basses or *Serranidae*. The following analysis gives most of the common characters of the group:

Body usually oblong, covered with scales, which are typically ctenoid, not smooth nor spinous, and of moderate size; lateral line typically present and concurrent with the back; head usually compressed laterally, and with the cheeks and opercles scaly; mouth variable, usually terminal and with lateral cleft, the teeth variable, but typically pointed, arranged in bands on the jaws, vomer, and palatine bones; gillrakers usually sharp, stoutish, armed with teeth; lower pharyngeals almost always separate, usually armed with cardiform teeth; third upper pharyngeal moderately enlarged, elongate, not articulated to the cranium, the fourth typically present; gills 4, a slit behind the fourth; gill-membranes free from the isthmus, and usually not connected with each other; pseudobranchiæ typically well developed; branchiostegals few, usually 6 or 7; no orbitosphenoid; no bony stay connecting the suborbital chain to the preopercle; opercular bones all well developed, normal in position, the preopercle typically serrate; no cranial spines; dorsal fin variously developed, but always with some spines in front, these typically stiff and pungent; anal fin typically short, usually with 3 spines, sometimes with a larger number, sometimes with none; caudal fin variable, usually lunate; pectoral fins well developed, inserted high; ventral fins always present, thoracic, separate, almost always with 1 spine and 5 rays; air-bladder usually present, without air-duct in the adult, simple, and generally adherent to the walls of the abdomen; stomach cœcal, with pyloric appendages, the intestines short in most species, long in the herbivorous forms; vertebral column well developed, none of the vertebrae especially modified, the number 10 + 14, except in certain extra-tropical and fresh-water forms, which retain the primitive higher numbers; shoulder-girdle normally developed, the post-temporal bifurcate, attached to the skull, but not coossified with it; none of the epipleural bones attached to the center of the vertebrae; coracoids normal, the hypercoracoid always with a median foramen, the basal bones of the pectoral (actinosts or pterygials) normally developed, 3 or 4 in number, hourglass-shaped, longer than broad; premaxillary forming the border of mouth, usually protractile; bones of the mandible distinct. Species very numerous, found in all seas except those of the Arctic regions. Many species inhabit fresh waters, especially in North America and Europe. These fresh-water forms are apparently nearer the primitive stock than the marine species are. The *Elassomidae*, *Centrarchidae*, and *Percidae* are the most primitive, and apparently form, with the *Percopsidae* and *Aphredoderidae*, an almost continuous series. This series, however, we are compelled to break in a linear arrangement for the purpose of bringing in other series of transitional forms, which culminate in *Berycoidea* and the *Scombroidea*.

KEY TO FAMILIES OF PERCOIDEA.

- a. Maxillary not sheathed by the preorbital or only partially covered by the edge of the latter; ventral with its accessory scale very small or wanting; opercle usually ending in a spine.
- b. Precaudal vertebrae with transverse processes from the third or fourth to the last; ribs all but the last 1 to 4, sessile, inserted on the centra behind the transverse processes; pseudobranchiæ large; dorsal spines about 10. *Kuhliidae*, p. 207
- bb. Precaudal vertebrae anteriorly without transverse processes; all or most of the ribs inserted on the transverse processes when these are developed.
- c. Anal spines 2, rarely 3; vertebrae 24 or 25; dorsal fin divided *Apogonichthyidae*, p. 209
- cc. Anal spines 3, never 2 nor 1; dorsal fin continuous or divided; vertebrae 24 to 35.
- d. Anal fin shorter than dorsal; head not everywhere covered with rough scales; postocular part of head not shortened *Serranidae*, p. 219
- dd. Anal fin scarcely shorter than dorsal and similar to it; head and body everywhere covered with rough scales; body deep, compressed *Priacanthidae*, p. 227
- aa. Maxillary slipping for most of its length under the edge of the preorbital, which forms a more or less distinct sheath; ventrals with an accessory scale; opercle without spines.
- c. Carnivorous species; teeth in jaws not all incisor-like.
- f. Spines of premaxillary not greatly produced, not extending backward to the occiput; mouth moderately protractile.

- g. Vomer with teeth..... *Lutjanidae*, p. 232
 g. Vomer without teeth; palatines and tongue toothless; anterior teeth conical, or else more or less incisor-like; preopercle entire..... *Sparidae*, p. 242
 ff. Spines of premaxillary extending backward to the occiput, so that the mouth is excessively protractile; lower pharyngeals well separated..... *Manidae*, p. 241
 ee. Herbivorous species; anterior teeth in jaws incisor-like; no molars or canines..... *Kyphosidae*, p. 246

Family LVIII. KUHLIIDÆ.

Body oblong, strongly compressed; scales large, ciliated; lateral line complete, the tubes straight and occupying the anterior half of the exposed surface of the scale; mouth large, protractile; maxillary exposed, without supplemental bone; teeth in jaws in villiform bands; teeth on vomer, palatines, entopterygoids, and ectopterygoids; tongue smooth; head partly naked; preorbital and preopercle denticulate; opercle with 2 spines; gill-membranes separate; 6 branchiostegals; pseudobranchiæ large; gillrakers long and slender; dorsal fins connected at the base, with x, 9 to 13 rays, the spinous portion longer than the soft; anal as much developed as the soft dorsal, with III, 10 to 12 rays; dorsal and anal fins fitting in a well-developed sheath; caudal emarginate, pectoral obtusely pointed, with 14 or 15 rays, upper the longest; ventrals behind base of pectoral, close together, with a strong spine; posterior processes of the premaxillaries not extending to the frontals; supraoccipital bone extending forward to between the post-frontal processes, its crest not extending on the upper surface of the cranium; parietals short, without crest; precaudal vertebrae with transverse processes behind the fourth; ribs all but the last 2 to 4 sessile, inserted on the centrum behind the transverse processes. (Boulenger.) Vertebrae 25 (10 or 11 + 14 or 15). One genus with 7 or 8 species inhabiting the Pacific Ocean, especially fresh and brackish waters of East Africa, the islands of the Indian and Pacific oceans, and north Australia.

Genus 118. KUHLIA Gill.

Body oblong, much compressed; head compressed; mouth short, oblique; maxillary without supplemental bone; lower jaw projecting; no canines; teeth subequal; preorbital sharply serrate; angle of preopercle without strong spine; gillrakers slender; pseudobranchiæ large; scales large, not very rough; lateral line distinctly arched in front; top of head naked; dorsal fin deeply notched, but not divided to base, with 10 slender spines; caudal lunate; anal spines graduated, the fin short. Coloration bright silvery. This genus contains 2 groups of species, one strictly marine, the other ascending the rivers. The Hawaiian species, found in estuaries, is intermediate.

Kuhlia Gill, Proc. Ac. Nat. Sci. Phila. 1861, 48 (*ciliata*).

Moronopsis Gill, op. cit. 1863, 82 (*marginatus*).

Paradules Bleeker, Nederl. Tijdschr. Dierkunde, 1, 257, 1863 (*marginatus = ciliatus*).

159. *Kuhlia malo* (Cuvier & Valenciennes). "*Ahólehóle*."

Head 3.4 in length; depth 2.6; eye 3.2 in head; snout 4; interorbital 3.3; maxillary 3; mandible 2.3; D. IX-r, 11; A. III, 11; scales 7-52-12; gillrakers 25 to 28.

Body oblong, strongly compressed, upper profile of head nearly straight; caudal peduncle compressed, its depth equal to length; head longer than deep; snout short, rather blunt; mouth oblique, lower jaw projecting; teeth minute, in bands on jaws, vomer, and palatines; tongue rather bluntly pointed, free anteriorly; maxillary reaching slightly beyond front margin of eye; eye very large, irregularly circular, its pupil slightly above axis of body, anterior; interorbital convex; 2 small, flat opercular spines, the lower the larger; origin of dorsal fin about over that of ventrals, behind that of pectoral, longest dorsal spine (fifth) 1.6 in head, longer than anterior soft rays; base of soft dorsal less than that of anal; caudal deeply forked, lobes pointed; anal spines graduated to the last, which is the longest, but shorter than the anterior or longest soft rays, longest spine 2.5 in head, longest ray 2.1 in head; ventrals reaching three-fourths distance to vent, 1.8 in head; pectoral 1.5 in head, not reaching as far as ventrals; scales ctenoid, 4 rows on cheek, those along bases of vertical fins very small; top of head naked, about 12 scales before dorsal; lateral line nearly concurrent with dorsal outline; caudal peduncle compressed, the least width 5 in least depth.

Color in life, bright silvery, bluish on back; fins dull whitish, the first dorsal and caudal narrowly edged with black; ventrals pure white; upper fins a little darker than lower; iris reddish silvery.

Young examples, when fresh, with top of head steel whitish with steel black reticulations and marblings which end in 2 dark stripes along side of back close to dorsal; soft dorsal with an inter-marginal stripe of dusky; caudal pale, margined with dusky all round, the bulk of the fin white.

Color in alcohol, bluish brown above, more or less dusky, especially on top of head; lower surface of body white, washed with silvery; vertical fins dusky, the margins of caudal and dorsals blackish; margin of anal pale; pectoral dusky, with a median yellowish spot, axil dusky; ventrals whitish; inside of gill-opening and axil of pectoral dusky.

This beautiful fish was quite common in the streams and brackish water on the islands of Oahu and Hawaii. Numerous specimens are in the collections from Honolulu, Moanalua, Heeia, Waialua, Hilo, and Kailua, and numbers were obtained also by Dr. Jenkins and by the *Albatross* at Puako Bay, Hawaii; Hanalei Bay, Huleia River, and Waimea River, Kauai; Laysan Island; and at Station 3844 on the southern coast of Molokai.

The species attains a length of 8 to 10 inches, though most of the examples seen were smaller; a very attractive little fish, possessing many of the habits of our sunfishes and basses, dwelling by preference in the running fresh-water streams, where it may be found in numbers in the deeper pools. It is a good food-fish, takes the hook readily, and possesses game qualities of no mean order. As a pan-fish it ranks with our species of *Lepomis* and *Eupomotis*. The species is of very wide distribution, having been recorded from South Africa, the East Indies, Australia, many of the islands of the South Pacific, the Hawaiian Islands, and many other localities.

Dules malo Cuvier & Valenciennes, Hist. Nat. Poiss., VII, 479, 1831, Matavia River, Tahiti.

Dules malo Lesson, Voy. Coquille, Zool., II, 226, pl. 52, 1831, Tahiti.

Dules leuciscus Jenyns, Zool. Voy. Beagle, 17, 1842, Tahiti.

Dules marginatus, Günther, Fische der Südsee, 24, 1873 (Sumatra, Java, Amboyna, Fiji, Society Islands, Bonham Islands, Gilbert Islands, Hawaiian Islands); Günther, Rep. Shore Fishes, Challenger, Zool., I, part VI, 59, 1880 (Hilo, Honolulu).

Moronopsis argenteus var. *sandvicensis* Steindachner, Beiträge, V, in Sitzb. Ak. Wiss. Wien, LXXIV, 1876, 205, Sandwich Islands.

Moronopsis marginatus, Streets, Bull. U. S. N. M., No. 7, 71, 1877 (Waialua, Oahu).

?*Dules humilis* De Vis, Proc. Linn. Soc. N. S. Wales, IX, 1884, 396, Queensland, Australia.

Moronopsis sandvicensis Steindachner, Sitzb. Ak. Wiss. Wien, XCVI, 1887, 56, (Sandwich Islands).

Kuhlia malo, Boulenger, Cat., I, 40, 1895 (South Africa; Mauritius; Rodriguez; Fiji Islands; Viti Levu, Tahiti; Hawaiian Islands; Hilo); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 483 (Honolulu); Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 502 (Hawaiian Islands); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 447 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 526 (Hawaiian Islands; Laysan Island).

160. *Kuhlia tæniura* (Cuvier & Valenciennes). Fig. 81.

D. x, 9 to 11; A. iii, 10 or 11; scales 5-50 to 55-13 or 14; depth 2.75 to 3 in total length; head 3.5 to 3.66; snout 0.66 diameter of eye, which is 2.66 to 3.25 times in length of head, and equals inter-orbital width; lower jaw projecting; maxillary extending to below anterior border or anterior third of eye, the width of its distal extremity 0.25 to 0.33 diameter of eye; cheeks and opercles with large ctenoid scales; angle and lower border of preopercle finely denticulated; lower opercular spine strong; 25 or 26 gillrakers on lower part of anterior arch; dorsal originating just behind vertical of axilla; fifth or fourth and fifth spines longest, 0.6 to 0.66 length of head, longer than anterior soft rays; tenth spine longer than ninth, as long as third or a little shorter; pectoral 0.66 length of head; ventral a little shorter, reaching anus, or not quite so far; anal as long as or slightly longer than its distance from caudal; third spine a little longer than second, as long as tenth dorsal; caudal deeply forked, middle rays 0.33 to 0.4 length of outer. Silvery bluish gray on back; top of soft dorsal blackish; caudal with 5 black bands, one along the middle rays, and two pairs converging posteriorly.

This species, common among lava rocks in the south seas, was obtained in 1881 on Johnston Island, south of Hawaii, and recorded by Smith & Swain. It is common at Samoa.

Dules tæniurus Cuvier & Valenciennes, Hist. Nat. Poiss., III, 114, 1829, Java; Bleeker Verh. Batav. Gen., XXII, 1849, Perc., 49 (Pagotang); Günther, Cat., I, 267, 1859; Kner, Novara, Fische, 47, 1865.

Perca argentea, Bennett, Fish. Ceylon, pl. XXII, 1830.

Dules benetti, Peters, Mon. Berl. Ac. 1855, 432 (Mozambique); Günther, Cat., I, 270, 1859.

Dules argenteus, Klunzinger, Verh. zool.-bot. Ges. Wien, XX, 1870, 730; Günther, Fische der Südsee, 25, pl. XIX, fig. C, 1873; Day, Fish. Ind., 67, pl. XVIII, fig. 2, 1875, and Fauna Ind., Fish. I, 504, 1889.

Moronopsis taniurus, Bleeker, Arch. Neerl., VII, 1872, 374 (Java; Sumatra); Atlas Ichth., VII, 119, pl. CCCXLV, fig. 5, 1876 (Java; Sumatra; Buro).

Paradules taniurus, Bleeker, Nederl. Tijdschr. Dierk., IV, 1873, 139.

Kuhlia tenuira, Smith & Swain, Proc. U. S. N. M., V, 1882, 128 (Johnston Island; Java; Chinese Sea; Sumatra).

Moronopsis argenteus, Klunzinger, Fische des roth. Meer., 25, 1884.

Kuhlia arge Jordan & Bollman, Proc. U. S. Nat. Mus., XII, 1889, 159, Chatham Island, Galapagos Archipelago; Jordan & Eigenmann, Bull. U. S. Fish Comm., VIII, 1888 (1890), 419.

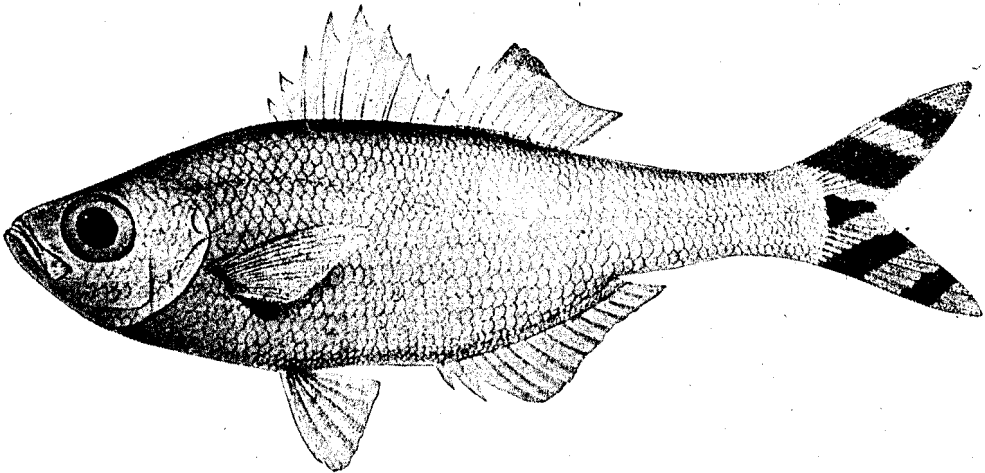


FIG. 81.—*Kuhlia tenuira* (Cuvier & Valenciennes) after Günther.

Family LIX. Apogonichthyidae.—The Cardinal Fishes.

Body oblong or elongate, sometimes compressed and elevated, covered with rather large scales, which are striated and ctenoid, or sometimes cycloid; cheeks scaly, lateral line continuous; cleft of mouth wide, oblique; villiform teeth on jaws and vomer and sometimes on palatines; canines sometimes present (teeth wanting in *Brephostoma*); preopercle with a double ridge, its edge entire or slightly serrated; opercular spine little developed; lower pharyngeals separate, with sharp teeth; pseudo-branchiæ present; branchiostegals 6 or 7; dorsal fins well separated, the first with 6 to 9 rather strong spines; no dorsal sheath or furrow; anal fin short, usually with 2 spines, sometimes with 3 or 4; ventral fins thoracic, 1, 5, without axillary scale. Small fishes of the Tropics, especially abundant in the East Indies, some of them in fresh waters, most of them in rather deep waters. Color often bright red. Genera about 15; species about 130.

The family is represented in Japan by at least 8 species, and notwithstanding their small size they have great importance as food-fishes. In the Hawaiian Islands we know 9 species, all of them small and only 2 of any importance for food. These fishes are most abundant among the coral rocks about tropical islands. Many of our most interesting specimens obtained at Honolulu were secured by breaking apart masses of dead coral, in the interstices of which they take refuge.

a. Canine teeth none; teeth all minute or villiform.

b. Preopercle with margins entire.

c. Teeth on vomer and palatines.

d. Lateral line complete and well developed..... *Mionorus*, p. 210

dd. Lateral line incomplete, ceasing under origin of soft dorsal..... *Foa*, p. 210

cc. No teeth on vomer or palatines..... *Ariomma*, p. 217

bb. Preopercle with at least posterior margin serrate, especially in the young..... *Amia*, p. 211

aa. Canine teeth present in front of jaws..... *Synagrops*, p. 218

Genus 119. *MIONORUS* Krefft.

This genus differs from *Amia* only in having the preopercle entire at all ages and the lateral line complete. The typical species (*lunatus*) has the body very deep and compressed and the dorsal spines elevated. Scales large (20 to 26) and weakly ctenoid; dorsal spines 7 in typical species, the soft dorsal and anal with 9 to 12 rays.

Small fishes, similar in habits to the species of *Amia*, *Foa*, and *Apogonichthys*, found in tropical seas in sandy bays or among corals. Several species known.

Mionorus Krefft, Proc. Zool. Soc. Lond. 1867, 942 (*lunatus*).

161. *Mionorus waikiki* (Jordan & Evermann). Plate 35.^a

Head 2.4 in length; depth 3; eye 3.2 in head; snout 4.6; interorbital 6; maxillary 2; D. VII-1, 8; A. II, 7; scales 2-24-5.

Body short, stout, and compressed; dorsal outline strongly arched from tip of snout to posterior base of soft dorsal; ventral outline comparatively straight from tip of mandible to origin of anal; vent immediately in front of origin of anal; caudal peduncle deep and compressed; head rather large; mouth large, slightly oblique, jaws equal, maxillary reaching posterior edge of pupil; eye rather small, slightly above axis of body; interorbital space narrow, little convex; opercular and preorbital bones entire; a band of small villiform teeth in each jaw, and on vomer and palatines; fins moderate, origin of spinous dorsal nearer base of last soft ray than tip of snout; first dorsal spine very short, second about half length of third, which is equal to eye and snout; base of soft dorsal equal to depth of caudal peduncle; longest dorsal rays 2.25 in head; caudal rounded, its length 1.75 in head; origin of anal slightly posterior to that of soft dorsal, its longest rays 2.4 in head; pectoral slender, reaching past origin of anal, its length 1.5 in head; ventrals short, barely reaching origin of anal, their length nearly 2 in head; scales large, weakly ctenoid, firm, and somewhat deeper than long; lateral line strongly developed, following outline of back until under last dorsal ray, where it curves downward, following middle line of caudal peduncle to base of caudal fin.

Color in alcohol, head and body rather dark brownish, a lighter crossband around body at nape and across opercles; another light band surrounding body between the 2 dorsal fins; 3 dark-brown lines radiating from the eye, the first downward across cheek to tip of maxillary, the second backward across cheek toward base of pectoral, the third upward and backward to origin of lateral line; spinous dorsal blackish, especially on last spine; soft dorsal, anal, and caudal dusky, narrowly edged with white; pectoral pale, crossed by about 6 obscure brownish crossbars; ventrals black or very dark brown, the outer rays somewhat paler.

The above description is based upon the type, No. 50639, U. S. N. M. (field No. 20), a specimen 1.5 inches long, obtained from the coral rocks in front of Waikiki, near Honolulu, August 22, 1901.

This species is related to *M. alutus* of the coast of Florida, from which it differs markedly in color and in the more slender body. Only one specimen was obtained by us. Other specimens were obtained by the Albatross at Stations 3872 and 3876, between Maui and Lanai, in 28 to 43 fathoms.

Apogonichthys waikiki Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 179, Waikiki, Oahu Island; Snyder, op. cit. (Jan. 19, 1904), 526 (Hawaiian Islands).

Genus 120. *FOA* Jordan & Evermann, new genus.

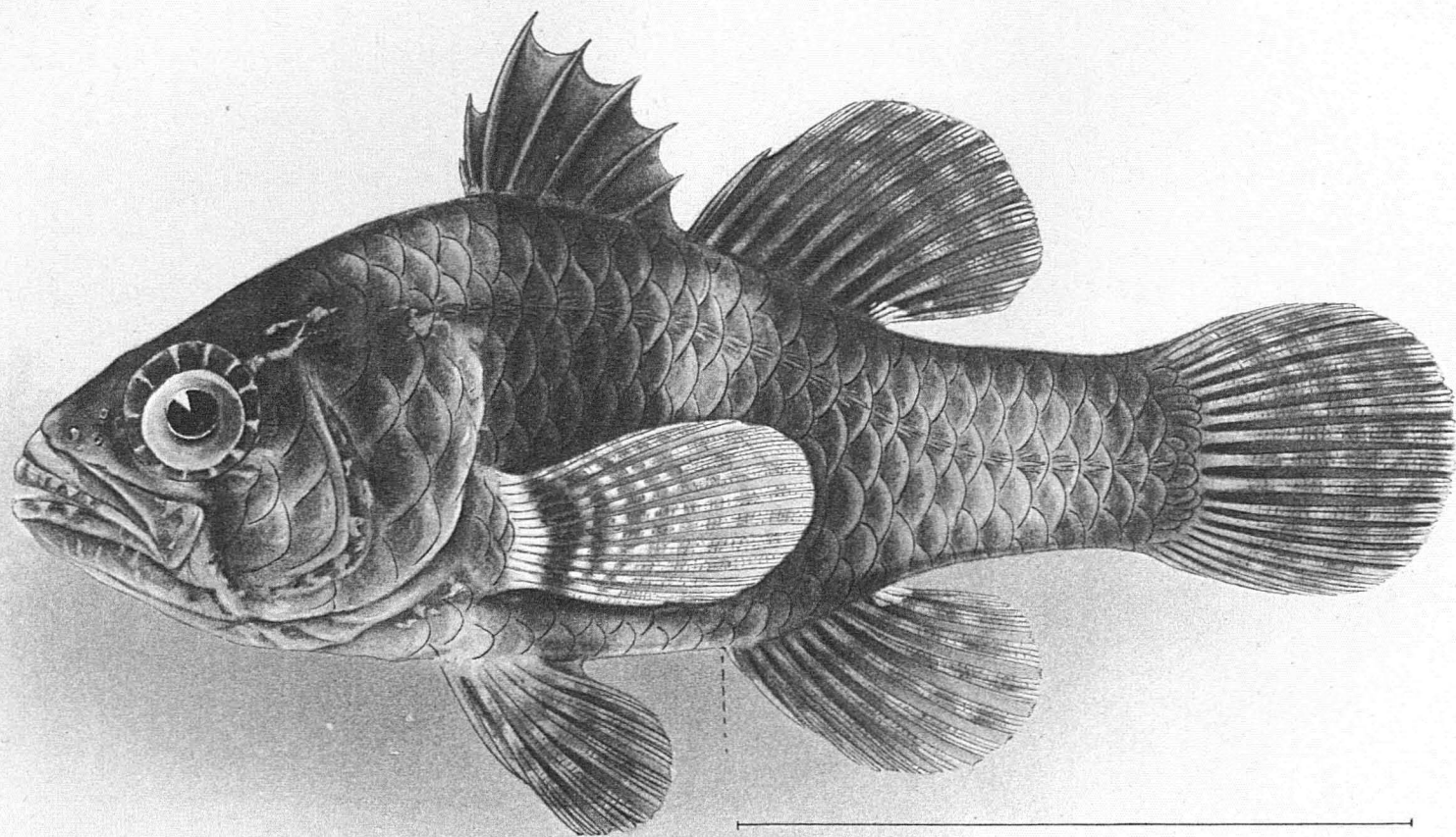
Foa Jordan & Evermann, new genus (*Fowleria brachy grammus*).

This genus differs from *Amia* only in the character of the lateral line, which is developed only on the anterior part of the body. The preopercle, as in *Mionorus*, is without serration.

Several species occur in crevices of coral rock in the South Seas. All of them are of very small size and some are brightly colored, several of them with a conspicuous black ear-spot. This genus differs from *Apogonichthys* in having palatine teeth. *Fo* is the Samoan name for fishes of this family.

Fowleria Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 180 (*auritus*).

^a *Apogonichthys waikiki* on plate.



APOGONICHTHYS WAIKIKI JORDAN & EVERMANN. TYPE.

162. *Foa brachygramma* (Jenkins). Fig. 82.

Head 2.5 in length; depth 2.5; eye 3.5 in head; snout 4.2; interorbital 4; maxillary 2; D. VII-I, 9; A. II, 8; scales 2-22-3.

Body short, deep, and compressed, dorsal and ventral outlines symmetrical; head rather large, conic; mouth large, moderately oblique, jaws equal; maxillary reaching posterior border of pupil; eye large, slightly above axis of body; caudal peduncle compressed, twice as deep as thick; nape somewhat elevated, the profile slightly concave above and back of the eyes; opercles and preorbital entire, without teeth; minute villiform teeth on jaws, vomer, and palatines, none on tongue; vent immediately in front of origin of anal fin; scales large, weakly ctenoid, moderately firm, deeper than long; 2 scales in front of dorsal; lateral line incomplete, beginning at upper edge of gill-opening and ceasing under front of soft dorsal, number of pores about 10; pores rudimentary or absent altogether on posterior half of side; fins rather large; first dorsal spine very short, its base midway between tip of snout and base of last soft ray; longest dorsal spine about 2 in head; soft dorsal well separated from the spinous part, its rays about 1.9 in head; caudal rounded, its length 1.7 in head; anal immediately under soft dorsal, its rays 1.9 in head; pectorals small, equal to snout and eye; ventrals short, not reaching anal, a little shorter than pectoral.

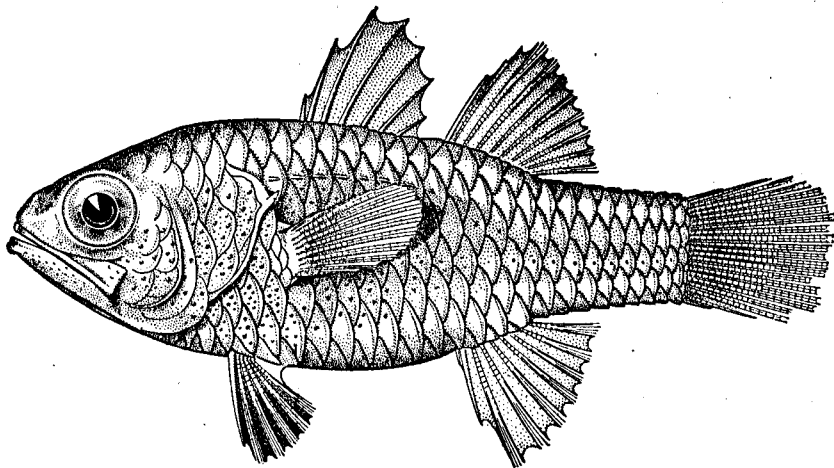


FIG. 82.—*Foa brachygramma* (Jenkins); from the type.

Color in life, plain; pectoral, light rosy; dorsal, caudal, and anal yellow; ventrals dusky.

Color in alcohol, rusty yellowish brown, opercles and side with more distinct brownish blotches; spinous dorsal dark; ventrals dark; other fins pale.

This species resembles *Apogonichthys auritus* of Cuvier & Valenciennes, which is the type of *Apogonichthys*. *A. auritus* has, however, a large black opercular spot bordered by a pale line, and the fins mottled and barred. Dr. Streets records it from Honolulu, which is doubtless an error.

Foa brachygramma reaches a length of about 2 inches. Three specimens were obtained by us from among coral rocks near the Moana Hotel at Waikiki and another at Hilo. A single specimen, the type of the species, was obtained by Dr. Jenkins at Honolulu in 1889, and others by the *Albatross* at Honolulu, at stations 3847 and 3849 on the southern coast of Molokai, and at stations 3872, 3873, 3875, and 3876, between Maui and Lanai, in 23 to 73 fathoms.

Apogon auritus, Streets, Bull. U. S. Nat. Mus., No. 7, 72, 1877 (Honolulu); not of Cuvier & Valenciennes.

Fowleria brachygrammus Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 447, fig. 18, Honolulu; Snyder, op. cit. (Jan. 19, 1904), 526 (Hawaiian Islands).

Genus 121. *AMIA* Gronow.

Body oblong, compressed, covered with large, ctenoid scales; lateral line continuous, with 20 to 30 scales; head large; mouth wide, oblique, the maxillary extending to below middle of the large eye; villiform teeth on jaws, vomer, and usually on palatines; no canine teeth; preopercle with a double

ridge, the edge somewhat serrate, at least in the young, becoming entire with age in some species; opercle with a spine behind; gillrakers rather long; dorsal spines 6 or 7, strong; second dorsal remote, short; anal with 2 spines and 8 or 9 soft rays, the second much the longer, the soft part similar to the soft dorsal; pectorals and ventrals moderate; vertebrae 11+14=25. Warm seas; the species numerous.

The species are much alike in form, but differ greatly in markings, the ground color being usually bright red or reddish silvery. The principal groups differ in number of dorsal spines and in the form of the caudal. Most of the Pacific species belong to the subgenus *Ostorhinchus*, while all the Atlantic species belong in the subgenus *Apogon*.

Amia Gronow, Zoophyl., 89, 1763 (*moluccensis*); Gill, Proc. Ac. Nat. Sci. Phila. 1862, 237 (*imberbis*).

Apogon Lacépède, Hist. Nat. Poiss., III, 411, 1801 (*ruber* = *imberbis*).

Ostorhinchus Lacépède, Hist. Nat. Poiss., IV, 24, 1802 (*fleurieu*, a species from the South Seas with 8 dorsal spines and a dark cross-band at base of caudal).

Monoprius Poey, Memorias, II, 123, 1856-58 (*maculatus*).

Pristiapogon Klunzinger, Synopsis, Fische des rothen Meeres, in Verhand. Gezells. Wien, I, 715, 1870 (*frenatus*).

a. Preopercle sharply serrate on posterior margin only, the anterior edges smooth or merely roughish.

b. Body with 6 or 7 longitudinal rows of black spots forming distinct lines.....*maculifera*, p. 212

bb. Body with 5 indistinct dark bands, none reaching the ventral surface.....*evermanni*, p. 213

aa. Preopercle sharply serrate on both margins; body without distinct rows of spots.

c. Second dorsal spine not the longest; color not bright reddish.

d. Caudal fin without black crescent.....*snyderi*, p. 214

dd. A broad black crescent on base of caudal fin, the horns extending to tips of outer rays.....*menescena*, p. 215

cc. Second dorsal spine longest; color of body bright reddish.....*erythrina*, p. 217

163. *Amia maculifera* (Garrett). Fig. 83.

Head 2.5 in length; depth 2.75; eye 3.2 in head; snout 4.2; maxillary 2; interorbital 4; mandible 1.6; D. VII (-VIII)-1, 9; A. II, 8; scales 2-24-5; gillrakers about 6 + 15, long and compressed, filaments short, the longest smaller than the longest gillrakers.

Body short, deep, and moderately compressed, the greatest depth less than length of head; caudal peduncle rather deep, its least depth 2.5 in head; head pointed, longer than deep, eye and postocular

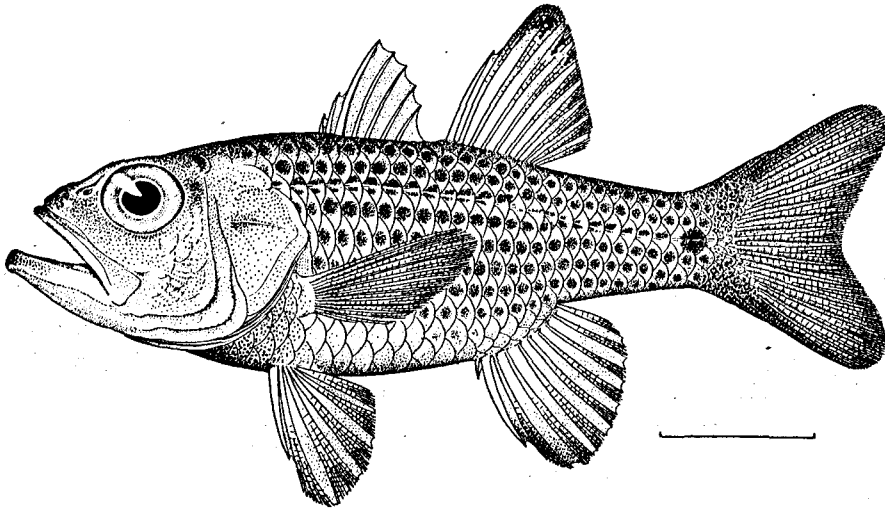


FIG. 83.—*Amia maculifera* (Garrett).

part equal to its depth; eye very large, anterior, much greater than snout; interorbital flat with a low median ridge; upper rim of orbit not projecting above the profile of head; snout pointed; jaws subequal; maxillary extending nearly to posterior margin of pupil; teeth villiform, in bands on jaws, vomer, and palatines; tongue small, rounded, thin, and free; mouth large, oblique; bones of the head cavernous; posterior margin of preopercle and edge of suborbital finely serrate; anterior margin of preopercle simply rough; origin of spinous dorsal over base of pectoral, third spine enlarged, 2.4 in

head; origin of soft dorsal slightly anterior to origin of anal, longest ray 1.7 in head; caudal deeply emarginate; longest anal spine 3 in head, longest ray 1.75 in head; pectoral long, reaching to above base of second anal ray, longest ray 1.6 in head; ventrals reaching nearly to origin of anal, 1.75 in head; scales large, finely ctenoid, deciduous, 4 in front of dorsal.

Color in life of an example (No. 5162) 5.6 inches long, body very pale purplish gray; belly pale orange; head dusky reddish orange, with purplish tinge; 6 or 7 rows of pale black spots longitudinally on body, the upper one over a part of lateral line; spinous dorsal orange-red, with rosy tinge, second spine delicate purple; second dorsal same color as first; caudal same color as dorsal, except its upper and lower edges blackish and its tip somewhat blackish; anal bright orange with reddish shade, tip blackish; ventrals same as anal, but brighter and the tips blackish; pectoral same as dorsal, but uniformly paler; posterior third of iris bright yellow, with greenish reflections mottled with blackish-violet marks.

Color in alcohol, light brownish, paler below, side with a series of about 8 horizontal lines made up of a series of rather large, distinct dark-brown spots on the centers of the scales; the line immediately above lateral line and the third one below it most distinct; in some cases the spots coalesce, forming continuous lines; top of head dusky olivaceous; cheek, opercles, and lower jaw densely covered with fine brown punctulations, some of those on preopercle slightly larger and blacker; an obscure dark bar from eye to gill-opening; breast pale, with a few obscure brownish punctulations; base of pectoral dusky; a large black blotch at base of caudal peduncle; dorsals and caudal somewhat dusky, other fins pale.

This species attains a length of about 6 inches and appears to be common among the Hawaiian Islands. Our collections contain numerous specimens from Honolulu and Hilo, and the *Albatross* secured it at Station 3875, between Maui and Lanai in 34 to 65 fathoms.

Apogon maculiferus Garrett, Proc. Cal. Ac. Nat. Sci., III, 1863, 105, Hawaiian Islands; Günther, Fische der Sudsee, I, 20, pl. XX fig. C, 1873 (Hawaiian Islands); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 484 (Laysan); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 448 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 526 (Albatross Station 3875, between Maui and Lanai).

164. *Amia evermanni* (Jordan & Snyder). Fig. 84.

Head, exclusive of opercular flap, 2.7 in length; depth 3.2; depth of caudal peduncle 2.7 in head; eye 3.5 in head; snout 3.5; maxillary 1.87; interorbital space 6.25; D. VI, 1-9; A. II, 8; pores in lateral line 25; Br. 7.

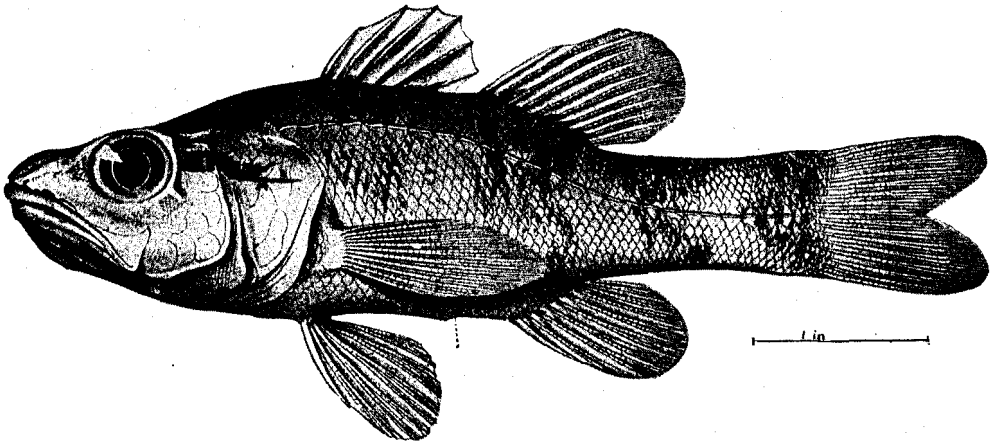


FIG. 84.—*Amia evermanni* (Jordan & Snyder); from the type.

Head conspicuously large; snout pointed; mouth large, the maxillary extending to a point midway between pupil and posterior margin of orbit; interorbital space concave, viewed either from the side or from before, its width equal to that of posterior edge of maxillary; edge of suborbital and lower edge of preopercle with large, thin, membranous flaps; anterior edge of preopercle smooth; upper part

of posterior edge finely serrated. Teeth villiform, in broad bands on the jaws, a V-shaped patch on the vomer, and in narrow bands on the palatines; gillrakers 5 + 16, the length of the longest contained 3 times in longitudinal diameter of eye; pseudobranchiae present.

Head naked, except on interopercle, preopercle, and upper part of opercle, where there are a few large smooth scales; scales of body ctenoid, the number in a longitudinal series immediately above the lateral line 54, between lateral line and spinous dorsal 3, between lateral line and anal 15; lateral line complete, its curve closely following that of dorsal contour of body, located on middle of caudal peduncle posteriorly. Third and fourth dorsal spines longest, 2.7 in head; first and sixth of equal length, half as long as the third; a slight space between dorsals, the spines when depressed just reaching base of second dorsal; spine of second dorsal measuring 3.16 in head; longest ray 1.87; distance between soft dorsal and base of caudal equal to width of space between anterior margin of eye and posterior edge of opercle; first anal spine minute, the second 3.5 in length of head; longest ray 2; ventral reaching a point midway between anal opening and base of anal fin; pectoral fin rather pointed, its tip reaching a vertical through middle of anal; caudal forked.

In alcohol the color is very light (in life probably red), the body with 5 rather indistinct dark bands, none of which reaches the ventral surface; the first on nape, second triangular in shape, extending from base of spinous dorsal to near middle of body, third passing from base of second dorsal to a point near base of anal, the fourth located just behind the second dorsal, fifth at base of caudal; a narrow, dusky band passing from tip of snout to eye; a similar band from posterior margin of eye to edge of opercle.

A single specimen about 5.6 inches long from the market at Honolulu. The condition of the tissues indicates that the example came from deep water. Type, No. 51 87, U. S. N. M., collector E. L. Berndt.

Apogon evermanni Jordan & Snyder, Proc. U. S. Nat. Mus., Vol. XXVIII, 1904 (Oct. 6), 123, Honolulu.

165. *Amia snyderi* (Jordan & Evermann). Plate 36^a and Fig. 85.

Head 2.7 in length; depth 3.1; eye 3.7 in head; snout 3.7; interorbital 4.5; maxillary 2.2; mandible 2; gape 3; D. VII-1, 9; A. II, 8; C. 17; P. 10; scales 2-25-5; Br. 6.

Body short and stout, moderately compressed, the dorsal and ventral outlines about equally

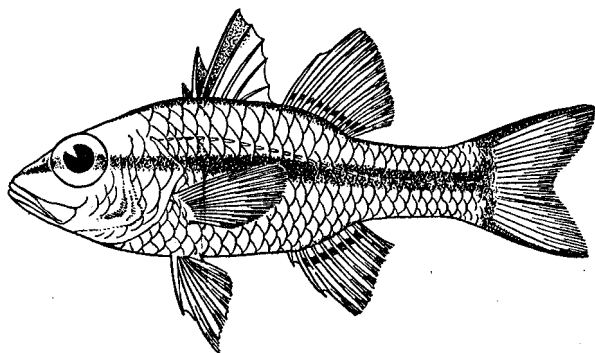
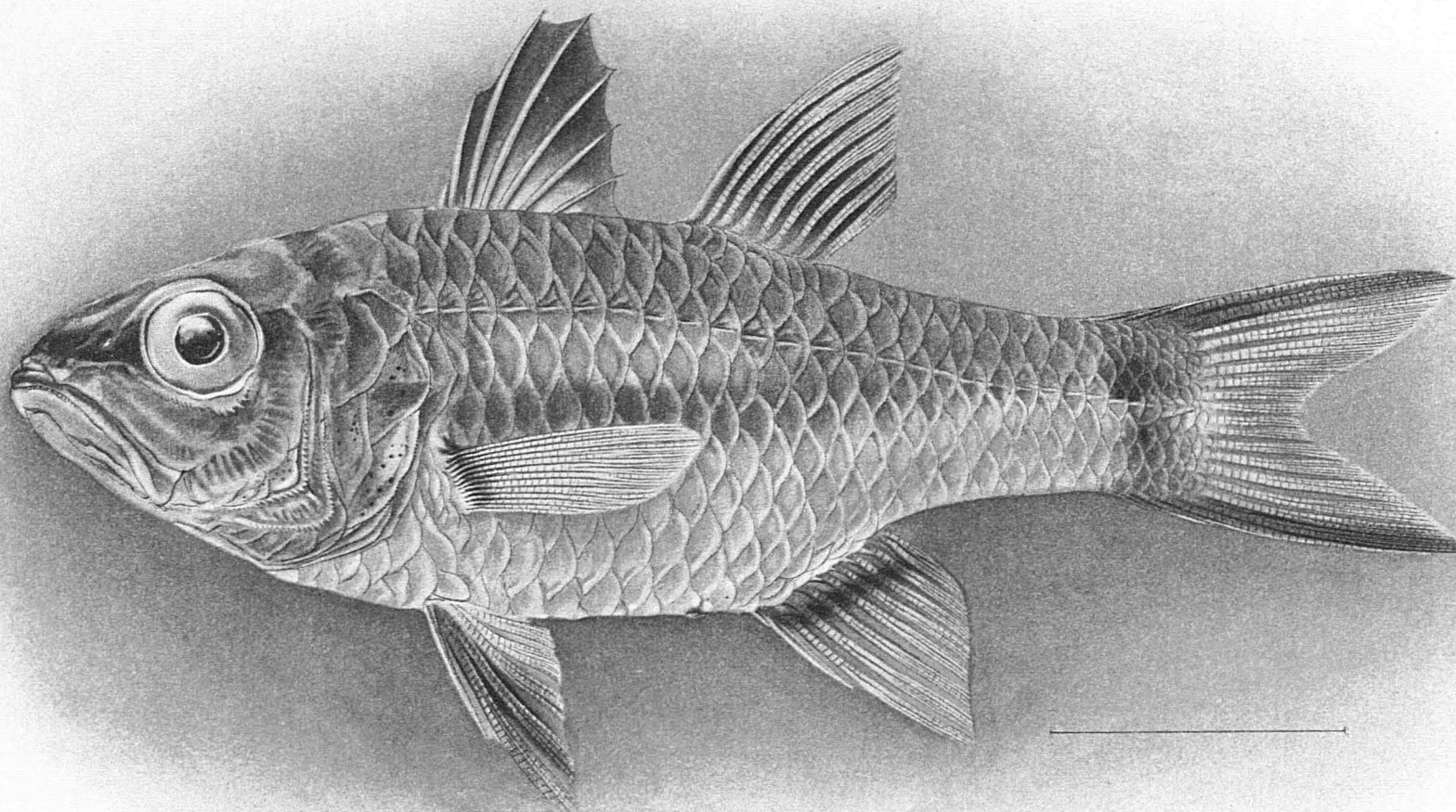


FIG. 85.—*Amia snyderi* (Jordan & Evermann); after Günther.

curved; head rather large, conic; snout conic, the anterior profile very slightly curved from tip of snout to origin of spinous dorsal; mouth oblique, jaws subequal, the lower slightly included; maxillary long, reaching not quite to posterior edge of pupil, its width at tip 2 in eye, supplemental bone well developed; interorbital space rather broad, slightly convex, preorbital narrow, least width 3 in eye; teeth on vomer and jaws, the latter in villiform bands, none on palatines; gillrakers slender, 10 on lower limb of first arch; caudal peduncle compressed and deep, the least width about 4 in its depth; scales large, deep, closely imbricated, strongly ctenoid and loose; lateral line beginning at upper end of gill-opening, nearly straight to base of caudal fin, 4 scales in front of spinous dorsal; nape with a striated shield; edge of opercle thin and smooth; both margins of preopercle and edge of interopercle serrate; teeth strongest at angles; a series of moderately strong teeth along lower edge of orbit; origin of spinous dorsal nearer snout than base of last dorsal ray; first dorsal spine very short, fourth longest, about 2 in head, second 2 in the fourth, seventh 2 in second; first soft rays longest, 1.8 in head; caudal deeply emarginate, longest rays about 1.6 in head; anal similar to soft dorsal, somewhat smaller, its origin under last rays of soft dorsal; ventrals pointed, scarcely reaching vent, 1.9 in head; pectoral reaching vertical at vent, 1.7 in head.

Color in alcohol, pale yellowish brown, darkest above; a darker brownish band extending from



APOGON SNYDERI JORDAN & EVERMANN. TYPE.

upper edge of opercle along side, just above lateral line, to posterior edge of soft dorsal; another broader, more distinct brown band from tip of snout through eye and along middle of side to base of caudal fin, covering lateral line on caudal peduncle; caudal peduncle at base of caudal fin with a broad dusky crossbar, usually darkest on upper half, sometimes obscure, sometimes with a darker blotch or spot in the upper portion; upper parts of head covered with fine dark brown punctulations; lower jaw similar, but somewhat paler; membranes of anterior 2 or 3 dorsal spines black, others finely punctulate; soft dorsal pale at base, above which is a broad indistinct dark crossband, the color confined chiefly to the interorbital membranes, this color extending to near tip of last rays; outer part of soft dorsal pale; anal similar to soft dorsal, the black bar narrower and nearer base of fin, rest of fin white; caudal dusky on membranes of outer 1 or 2 rays, the fin otherwise white, with a few fine punctulations on the interradiar membranes; ventrals pale; distal parts of the first and second rays and their connecting membrane black; pectoral pale, axil and base of pectoral somewhat dusky.

Color in life (field No. 198, O. P. J.), pale red; 2 longitudinal pearly lines on body; first dorsal with a dusky olivaceous anterior border; white lines along fourth, fifth, sixth, and seventh spines, the membranes olivaceous; second dorsal with many white and some olivaceous spots; anal with a dusky line along base, the distal part red; base of caudal dusky, rest of fin pale red; ventral with a white spot near tip; pectoral pink; iris yellow.

Another example (field No. 03499) was coppery brown when fresh, with trace of dusky band along side; a faint black bar at base of caudal, forming a black spot above end of lateral line; some dusky on opercle; first dorsal dusky; second dorsal brownish red with some dark; anal same with a basal flesh-colored bar below it; caudal reddish brown; ventrals same, with first ray pinkish and dusky behind it; some dusky on opercle.

This species reaches a length of about 6 inches. It was obtained by Garrett in the Hawaiian, Society, and Paumotu islands. Our collections contain numerous specimens from Honolulu and Hilo. We have examined also 12 specimens in the collection made by Dr. O. P. Jenkins.

The species closely resembles *Amia menesema*, from which it differs chiefly in coloration; the black caudal crescent, which is such an excellent distinguishing mark in *A. menesema*, is wholly absent in this species; moreover, the 2 silvery lateral bands, which become dark brown in spirits, are not found in *A. menesema*; and the black on the anal and soft dorsal is less conspicuous in *A. snyderi*.

A fairly good figure of this species is given by Günther in *Fische der Südsee*, under the erroneous name of *Amia frenata*. The species belongs to the subgenus *Pristiapogon* of Klunzinger, having both limbs of the preopercle serrate.

Our collections contain many specimens from Honolulu and Hilo, ranging in length from 3 to 5.5 inches.

Apogon frenatus, Günther, *Fische der Südsee*, I, 19, taf. 19, fig. A, 1873 (Hawaiian, Society, and Paumotu islands); Steindachner, *Denks. Ak. Wiss. Wien*, LXX, 1900, 484 (Honolulu); not *Apogon frenatus* Valenciennes, *Nouv. Ann. Mus. Hist. Nat.*, 1832, 57, pl. 4, fig. 4; nor of Klunzinger.

Apogon snyderi Jordan & Evermann, *Bull. U. S. Fish Comm.*, XXII, 1902 (Apr. 11, 1903), 180, Honolulu; Jenkins, *op. cit.* (Sept. 23, 1903), 448 (Honolulu); Snyder, *op. cit.* (Jan. 19, 1904), 526 (Hawaiian and Laysan islands).

166. *Amia menesema* (Jenkins). "*Upapālu*." Plate XIII and Fig. 86.

Head 2.5 in length; depth 2.8; eye 3.75 in head; snout 3.9; maxillary 1.9; interorbital 4; mandible 1.75; D. VII-1, 9; A. II, 8; scales 2-25-5.

Body short, deep, moderately compressed, greatest depth less than length of head; caudal peduncle rather deep, its least depth 2.3 in head; head subconic, longer than deep, its depth slightly greater than eye and postocular part of head; snout bluntly rounded; jaws equal; mouth large, slightly oblique; bands of small villiform teeth on jaws, vomer, and palatines; tongue rather thick, narrowly pointed, free; maxillary reaching posterior margin of pupil, which is above axis of body, anterior; interorbital very slightly convex; longest dorsal spine 2.2 in head; preopercle sharply serrate on anterior as well as posterior margin; longest dorsal ray 1.8; caudal deeply emarginate; anal similar to soft dorsal, longest ray 1.8 in head; ventrals reaching nearly to anterior base of anal, 1.8 in head; pectoral reaching to origin of anal, 1.6 in head; scales large, weakly ctenoid, deciduous; lateral line complete, concurrent with dorsal outline.

Color in life, coppery purple, dull and clouded with grayish; sides and belly with bluish luster; first dorsal dull reddish, with membrane of first two spines jet black; second dorsal dirty pink, with a

blackish bar near base, the tip blackish; anal same as soft dorsal; caudal dirty pink, with a broad blackish stripe along middle of each lobe, extending forward on median line of caudal peduncle above and below, these connected by a stripe; a curved black crossbar parallel with edge of fin; pectoral bright pink; ventrals pale pink, with black tips; body unmarked except a dusky shade across caudal peduncle connecting bases of the 2 caudal stripes.

Color of another specimen (No. 03439), when fresh, coppery, with blue and silvery reflection over body and head; fins, except the black areas, rosy.

Color in alcohol, light brown, becoming paler below and dusky grayish on belly; first 2 or 3 dorsal spines and their connecting membranes black, rest of fin pale with very light brown specks; soft dorsal and anal white, each with a broad, jet-black bar extending across the rays, the anterior end on lower fourth of rays, the bar gradually rising until on the last rays it is near their tip; caudal pale with a broad jet-black crescent across its base and extending to tips of fin on the 2 or 3 outer rays but one, the outer ray being white; between this crescent and caudal peduncle a lighter area, the color of the bar, confined chiefly to the membranes; rest of fin white, with obscure dusky specks; ventrals

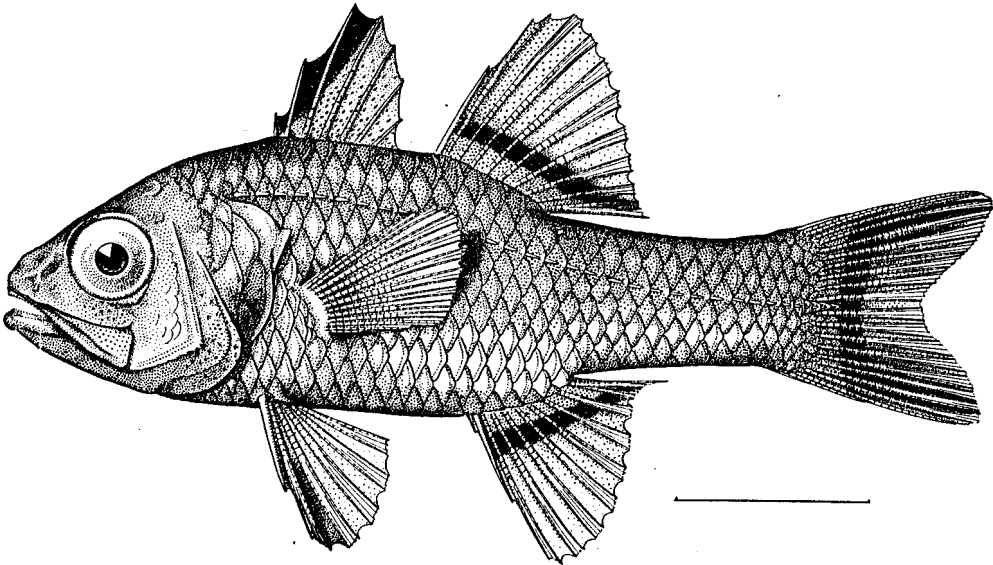


FIG. 85.—*Amia menesma* (Jenkins); from the type.

pale, with a few obscure dusky specks, tips of the longest 2 rays dark; pectoral pale, with obscure darkish punctulations; no trace of any streaks or bars on side of dark spot on caudal peduncle.

The above description is based chiefly upon a specimen (No. 02919) 6.25 inches long, from Honolulu.

This species is closely related to *A. snyderi*, from which it differs, however, in the smaller eye and the entire absence of the dark lateral stripe and the presence of a black crescent on the caudal fin; the black bar on the soft dorsal and anal is in each case farther up on the fin than it is in *A. snyderi*. This species reaches a length of at least 7 inches and appears to be abundant among the Hawaiian Islands. Besides the numerous specimens in our own collection from Honolulu, Hilo, and Kailua, we have examined 11 examples obtained by Dr. Jenkins and others collected by the *Albatross* at Laysan Island and on the southern coast of Molokai. We have also a specimen from Papeete, Tahiti.

Apogon menesmus Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 448, fig. 19, Honolulu (Type, No. 50700, U. S. Nat. Mus., Coll. O. P. Jenkins); Snyder, op. cit. (Jan. 19, 1904), 526 (Laysan Island; Honolulu; Albatrossstation 3834).

167. *Amia erythrina* (Snyder). Plate 34, fig. 2.^a

Head, including opercular flap, 2.5 in length; depth 2.5; depth of caudal peduncle 6; eye 2.7 in head; snout 4.9; maxillary 2.2; D. vi, 1, 9; A. ii, 8; P. 14; scales 3-26-7, 5 in front of dorsal; width of body at pectorals about half the depth; caudal peduncle slender; distance between last anal ray and base of caudal 3.12 in length.

Head short, snout blunt and rounded, lower jaw included; interorbital space flat, with a slight median elevation, width equal to diameter of eye; mouth oblique, the maxillary extending to the posterior border of eye, the expanded portion with a slightly convex posterior border; both margins of preopercle weakly serrated; teeth on jaws, vomer, and palatines, the latter covering a small anterior area of bones; gillrakers on vertical limb of arch mere papillae, except a long slender one at angle; those on horizontal limb long and slender near the angle, gradually reduced in length to near middle of limb, where they are short and rudimentary; scales weakly ctenoid; cheeks and opercles with scales; first dorsal spine short and weak; second very strong, its length 1.67 in head, when depressed reaching base of second dorsal ray; remaining spines graduated in length to the last, which is about 3.3 in second; spine of soft dorsal very slender, equal in length to fourth spine of first dorsal; longest rays 1.58 in head; anal rays about equal in length to those of dorsal; caudal 0.3 of the length, its margin with a deep notch; pectoral 4.5 in length, ventrals 4.5.

Color reddish orange, scales edged with a narrow band of a somewhat deeper hue; occiput and a spot on opercle dusky; a small black spot at origin of spinous dorsal; minute dark specks on nape, along base of dorsals, at base of caudal, on breast and on opercles; fins immaculate.

Distinguished from the other Hawaiian species by the bright reddish color, the absence of large spots or bars on the body and fins, and by having the second dorsal spine largest.

Type, No. 50876, U. S. N. M., Puako Bay, Hawaii. Length 1.4 inches. Other specimens, among which are cotypes, No. 7733, L. S. Jr. Univ. Mus., are from Honolulu; Hanalei Bay, Kauai; and Laysan Island. The species was also obtained in Samoa.

Apogon erythrinus Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 526, pl. 9, fig. 17, Puako Bay, Hawaii.

Genus 122. *ARIOMMA* Jordan & Snyder.

Body not greatly compressed; head large; caudal peduncle slender, cylindrical; eyes large, with thin adipose lids; mouth small, the maxillary short, broad, rounded posteriorly; teeth on jaws, none on vomer and palatines; pseudobranchiae present; preopercle smooth; head and body with scales, about 55 in lateral series; soft dorsal and anal elongate.

Only one species known.

Ariomma Jordan & Snyder, Proc. U. S. Nat. Mus., XXVII, 1904, 942 (*lurida*).

168. *Ariomma lurida* Jordan & Snyder. Plate 37.

Head 2.9 in length; depth 4; eye 3 in head; snout 3.3; interorbital width 4; depth of caudal peduncle 7; D. x, 17; A. 15; P. 20; scales in lateral series 55 or more.

Width of body a little greater than half its greatest depth; caudal peduncle cylindrical and markedly slender; interorbital space slightly convex; eye extremely large, with thin, transparent adipose lids, the posterior extending to edge of pupil, the anterior not more than one-fifth as wide; nostrils near tip of snout; lower jaw projecting a little beyond the upper; length of maxillary equal to interorbital width; jaws each with a single row of slender, minute teeth, those on lower jaw curved backward; no teeth on vomer or palatines; pseudobranchiae large; gillrakers on first arch 9+19, those near the angle long and slender, the others growing successively shorter toward either end of arch; preopercle entire; scales probably between 55 and 65 in a lateral series, probably present on head, including upper part of snout and cheeks, scale-pits being present on occiput and below eye; lateral line probably developed, its anterior end below base of dorsal a distance equal to diameter of pupil; origin of dorsal above base of pectoral; soft dorsal and anal coterminous, the length of caudal peduncle measured to bases of upper and lower rays equal to length of maxillary; ventrals inserted on a vertical through second or third dorsal spine; caudal fin probably concave or forked. Whether the

^a *Apogon erythrinus* on plate.

anterior rays of the anal are spinous or articulate can not be determined, but they are probably spinous. No distinctive color markings are apparent.

This species is represented by 2 small specimens, each about 7.5 inches long, in a very bad state of preservation, the scales having all been lost and the fins broken. The specimens were collected at Honolulu by Mr. E. L. Berndt, to whom we are indebted for them. Type, No. 51400, U. S. N. M. Cotype, No. 8441, Stanford Univ. Mus.

Ariomma turida Jordan & Snyder, Proc. U. S. Nat. Mus., XXVII, 1904, 943, Honolulu.

Genus 123. SYNAGROPS Günther.

Body rather elongate, covered with rather large, cycloid, deciduous scales, about 35 in lateral line; scales of head covered with very small scales; eyes large; jaws with a band of villiform teeth and with strong canines in front; small or villiform teeth on vomer and palatines; preopercle with its angle produced and with soft serrations; dorsal rays IX-1, 10; anal II, 7; vent normal. Coloration black.

One species known from deep water in Japan and one from the Hawaiian Islands.

Melanostoma Döderlein, Beiträge zur Kenntniss Fische Japans, II, 5, 1883, in Denks. Ak. Wiss. Wein, XLVIII, 1884 (*japonicum*). (Name preoccupied.)

Synagrops Günther, Challenger, Rept., XXII, 16, 1887 (*japonicus*).

169. *Synagrops argyrea* (Gilbert & Cramer). Fig. 87.

Head 2.88; depth 3.75; D. XI-1, 9; A. II, 7; P. 14 or 15; V. I, 5; lateral line 28 to 29 (+ 2 or 3 on tail); 2 scales in a transverse series between lateral line and origin of first dorsal fin; width of body at base of pectorals nearly 2 in the depth; least depth of caudal peduncle 2.25 in greatest depth of body; greatest width of head 1.5 in the greatest depth; orbit 3 to 3.25 in head; maxillary 2.25; ventral spine 2.5; snout 1.3 in orbit; distance from tip of snout to origin of first dorsal 2.67 in body; from tip of snout to origin of anal a little more than 1.5; from root of ventrals to origin of anal 3.13; base of first dorsal 5.5; base of second dorsal 8.3; distance between dorsals 10; base of anal 9.

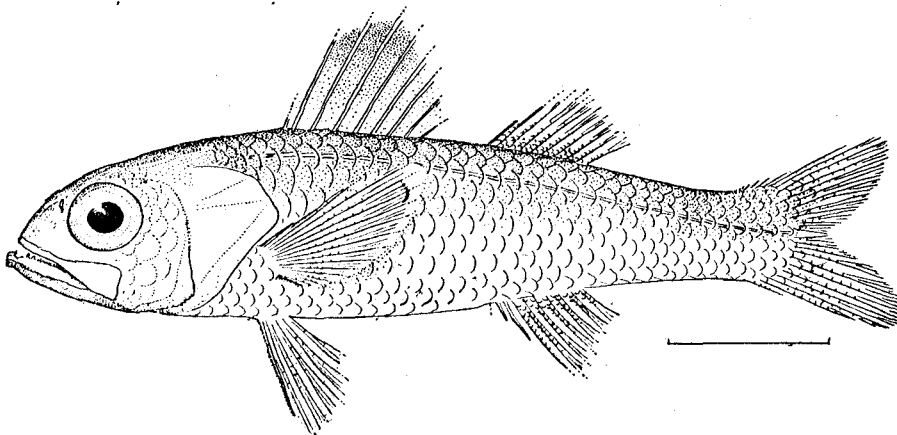
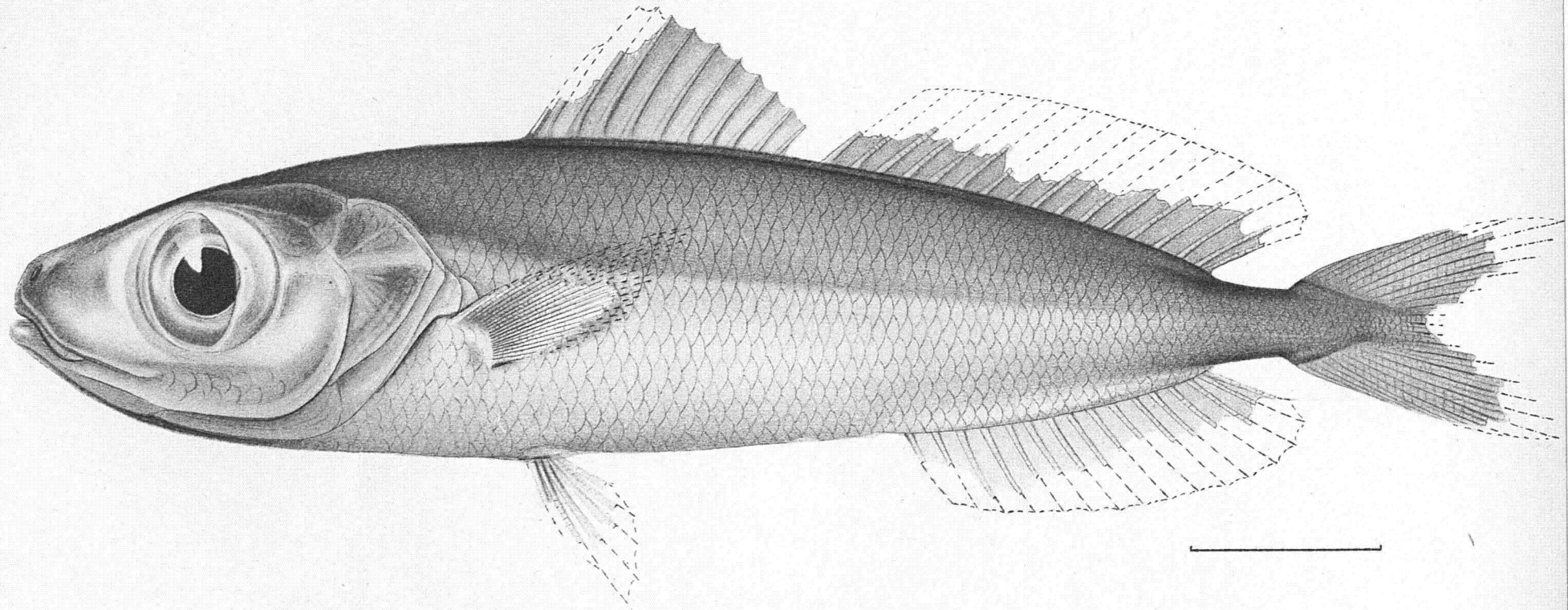


FIG. 87.—*Synagrops argyrea* (Gilbert & Cramer); from the type.

Body elongate, compressed; head compressed, dorsal and ventral profiles convex, similar; tip of snout about on a level with lower margin of pupil; orbit large; jaws equal, or the lower very slightly projecting, entering the steep profile; maxillary with a ridge along the middle, reaching to or a little beyond center of eye, much expanded behind, the end emarginate, lower posterior angle somewhat enlarged into a lobe; small teeth in bands on jaws, vomer, and palatines; a large canine tooth inside of band of small teeth near anterior end of each premaxillary, tip of lower jaw fitting between them; each ramus of lower jaw with 9 canine teeth in a single series, 2 very close together at each side of tip of lower jaw, just outside of these a depression in jaw into which fits canine of upper jaw, and behind this 7 nearly equidistant teeth, of which the most anterior is smallest and the fourth the largest, or as large as those behind it; small teeth outside of the row of canines, very few in number



ARIOMMA LURIDA JORDAN & EVERMANN. TYPE.

in lower jaw; canines sometimes as few as 5 in number on each side; posterior nares narrow, vertical slits close in front of rim of orbit and on a level with upper rim of pupil; anterior nares small, circular, and the distance between posterior and anterior nares 5 in orbit; interorbital space convex, its width a little less than orbit, divided into areas by a series of low, thin ridges, one of these, quite as long as snout, extending forward along median line of occiput to about the vertical from posterior margin of orbit; on each side of this, a little behind its anterior end, begins a curved ridge which runs forward and outward to about the vertical from the hinder edge of the pupil, and thence forward and inward to the median line between the anterior nares, these symmetrical ridges forming a pear-shaped figure with its pointed end directed forward; on each side, at the greatest convexity of the above ridges, at the vertical of the posterior margin of the pupil, begins another ridge which runs straight forward and outward close to the antero-dorsal margin of the orbit, then curves inward and forward inside of the nares to a point in advance of the anterior nares and not far from the middle one; suborbital ring narrow; posterior edge of preopercle nearly vertical and straight, directed a little downward and backward and very slightly curved backward near its posterior end, producing a prominent rounded angle, both edges closely serrated, the serrations strongest, almost in the form of small spines, at the angle and at the ridge of the opercle forming a rounded and obtuse but marked angle, with inferior edge serrated; opercle with slightly diverging ridges, the lower nearly horizontal and a little more strongly developed than the upper, both ending in small spines; gillrakers 13 on the anterior limb of first arch, the longest about 3 in eye; peritoneum black; scales large, thin, cycloid, very deciduous; interorbital space, snout, and lower jaw, and apparently the maxillary and opercles, scaleless; cheek with large, thin, embedded scales; second dorsal, anal, and caudal scaly on their basal parts; lateral line high up and continued on to basal part of dorsal fin; origin of first dorsal fin over root of pectoral, its third spine probably longest, at least half as long as head, the spines slender and weak; origin of second dorsal a little in front of origin of anal, the rays heavy; first spine of anal short, the second longer, 1.5 in orbit, the soft rays thick; caudal deeply forked, the longest rays at least half length of head, and (the ends of the rays of second dorsal, of anal, and caudal all injured); upper end of root of pectoral about on a level with lower edge of pupil, the width of the base less than half orbit, the longest rays (injured at tips) at least two-ninths of bony length; root of ventrals under root of pectoral; ventral spine with its outer edge densely serrate, the soft rays more than half as long as head.

Color in alcohol, though the scales are nearly all off, the back and upper part of side light brownish, with black lines at the edge of the fallen scales; top of head and snout dusky; sides of head and lower three-fifths of trunk and tail silvery; first dorsal fin blackish in the distal half, the other fins a little dusky; mouth cavity not dark, the gill-cavity a little dusky.

A second, smaller specimen differs from the type in having only 5 instead of 9 canines in each lower jaw, its depth a little greater, orbit larger, gillrakers a little shorter. Aside from some very slight differences in the proportions, it agrees in even minutest details with the type.

Length 3.75 and 5.5 inches. Described from examples dredged at stations 3472 and 3476, in 295 and 298 fathoms, by the *Albatross* in 1891 off the Hawaiian Islands. (Gilbert and Cramer.)

This species is said to be close to *Synagrops japonica* of Steindachner and Döderlein, differing from it, among other characters, in the serrated ventral spine, large number of canine teeth, greater length of second anal spine, in the color, the relative development of the 2 opercular ridges, and the absence of black color in the mouth cavity.

Melanostoma argyreum Gilbert & Cramer, Proc. U. S. Nat. Mus., XIX, 1896, 416, Pl. XXXIX, fig. 3, *Albatross* stations 3472 and 3476, off the Hawaiian Islands, in 275 and 298 fathoms. (Type, No. 47732 U.S.N.M.)

Family LX. SERRANIDÆ.—The Sea Basses.

Body oblong, more or less compressed, covered with adherent scales of moderate or small size, which are usually but not always ctenoid; dorsal and ventral outlines usually not perfectly corresponding; mouth moderate or large, not very oblique, the premaxillary protractile and the broad maxillary usually not slipping for its whole length into a sheath formed by the preorbital, which is usually narrow; supplemental maxillary present or absent; teeth all conical or pointed, in bands, present on jaws, vomer, and palatines; gillrakers long or short, usually stiff, armed with teeth; gills 4, a long slit behind the fourth; pseudobranchiæ present, large; lower pharyngeals rather narrow, with pointed teeth, separate (except in *Centrogenys*); gill-membranes separate, free from the isthmus; branchioste-

gals normally 7 (occasionally 6); cheeks and opercles always scaly; preopercle with its margin more or less serrate, rarely entire; the opercles usually ending in 1 or 2 flat, spine-like points; nostrils double; lateral line single, not extending on the caudal fin; skull without cranial spines, and usually without well-developed cavernous structure; no suborbital stay; post-temporal normal; second suborbital with an internal lamina supporting the globe of the eye; entopterygoid present; all or most of the ribs inserted on the transverse processes when these are developed; anterior vertebrae without transverse processes; dorsal spines usually stiff, 2 to 15 in number; soft dorsal with 10 to 30 rays; anal fin rather short, its soft rays 7 to 12, its spines, if present, always 3, in certain genera (*Grammistinae*, *Rypticinae*) altogether wanting; ventrals thoracic, usually 1, 5 (1, 4, in *Plesiopinae*) normally developed, without distinct axillary scale; pectoral well developed, the rays branched, with narrow base; caudal peduncle stout, the fin variously formed; vertebrae typically $10 + 14 = 24$, the number sometimes increased, never more than 35; air-bladder present, usually small and adherent to the wall of the abdomen; stomach caecal, with few or many pyloric appendages; intestines short, as is usual in carnivorous fishes. Genera 60 to 70; species about 400. Carnivorous fishes, chiefly marine, and found in all warm seas; several genera found in fresh waters. As here understood, the *Serranidae* comprise the most of the family of *Percidae* as understood by Günther and others, exclusive of those with imperfect pseudobranchiae, those with 1 or 2 anal spines, those with the number of vertebrae increased, those in which the whole length of the maxillary slips under the preorbital, and those with the anal fin many-rayed and the cranium shortened behind. As here understood, the *Serranidae* are essentially equivalent to the *Serraninae* and *Grammistinae* of Boulenger's Catalogue. Even after these eliminations, the family is considerably varied. Of the many recognized genera, only 3 are known to have representatives among the Hawaiian Islands.

- a. Maxillary with a distinct supplemental bone; inner teeth of jaws depressible or hinged.
 b. Dorsal spines not more than 9.
 c. Dorsal spines VIII, the fin divided *Pikea*, p. 220
 cc. Dorsal spines IX *Cephalopholis*, p. 221
 bb. Dorsal spines XI, rarely X *Epinephelus*, p. 222
 aa. Maxillary without supplemental bone; inner teeth of jaws not depressible or hinged.
 d. Patch of fine teeth on tongue; angle of preopercle salient with enlarged teeth; maxillary completely sealed; third dorsal spine longest, considerably produced *Odontanthias*, p. 225
 dd. No teeth on tongue; angle of preopercle rounded, without enlarged teeth; only upper half of maxillary sealed; third dorsal spine not the longest and not produced *Pseudanthias* p. 226

Genus 124. PIKEA Steindachner.

Body elongate, the caudal peduncle robust; mouth moderate, the lower jaw projecting; maxillaries scaly; teeth small, uniform, the inner depressible; preopercle finely serrate; opercle with 3 flat spines; numerous pores on head; scales large; lateral line with a strong upward curve, as in *Anthias*; dorsal spines moderate, 8 in number, the third highest, the fin deeply notched; soft dorsal and anal short; caudal short, lunate; pectoral long, falcate; vertebrae 10+14. Few species known, mostly from deep water; only one thus far known from the Hawaiian Islands.

Pikea Steindachner, Sitzb. Ak. Wiss. Wien, LXXI, 1874, 375 (*innulata*).

170. *Pikea aurora* Jordan & Evermann. Plate XIV.

Head 2.5 in length; depth 3; eye 5 in head; snout 4; interorbital 6.2; maxillary 2.25; D. VIII, 13; A. III, 8; scales 5-55-22; Br. 7; gillrakers short and rather weak, about 9 + 5.

Body moderately stout, the back slightly elevated, head rather long and pointed; snout depressed, the anterior profile nearly straight from tip of snout to occiput; mouth large, maxillary reaching posterior margin of pupil, supplemental bone developed, the tip broad, 1.5 in orbit; mouth somewhat oblique, the lower jaw strongly projecting; teeth in broad villiform bands on jaws, vomer, and palatines; tongue naked; eye moderate, high up, chiefly above axis of body; anterior nostril in a short tube at edge of prenasal; posterior nostril small, round, near upper anterior edge of orbit; edge of preopercle slightly dentate, especially on lower arm; opercle ending in a broad flap with a weak, flat spine; pseudobranchiae rather small; interorbital low, very little convex; caudal peduncle stout, compressed, and very deep, the depth equaling snout and eye; fins rather small; origin of dorsal posterior to that of pectoral, slightly nearer base of last ray than tip of snout; dorsal spines low and weak, the third

longest, 3.6 in head; soft portion of dorsal somewhat elevated and pointed, with longest ray 1.9 in head; anal similar to soft dorsal but smaller and somewhat posterior, fifth ray 2 in head; caudal truncate or slightly lunate; ventrals short, not nearly reaching vent, their length 1.75 in head; pectoral rather long and slender, reaching origin of anal, its length about 1.4 in head; scales rather small, finely ciliate, somewhat loose; entire head, except interorbital, snout, and under parts, scaled; lateral line well developed, complete, with a strong arch above the pectoral and distinctly decurved under last dorsal ray.

Color in life (field No. 03342), top of head, upper half of anterior part of body, and whole posterior half of body pale rosy; lower part of head and lower parts of anterior half of body white with faint rosy wash; top of head and back in front of dorsal vermiculated with greenish yellow lines; middle portion of upper jaw yellow with a broad sulphur-yellow stripe from it to eye, then back of eye to opercular opening; a narrow sulphur stripe on posterior edge of maxillary and continued interruptedly downward and backward across cheek to opercle; a few small yellow spots across cheek between the two stripes; tip of lower jaw yellow; yellow of back in about 6 indefinite lines; dorsal pale rosy, spinous part greenish yellow at base, this extending toward tip posteriorly and forming a submarginal yellow stripe on soft part, narrowly bordered above by rosy; rest of fin rosy; caudal dark rosy, paler toward tip, then with blackish red edge, a greenish yellow stripe along upper and lower margins narrowly edged with rosy; anal yellow anteriorly, rest of fin pale rosy; pectoral and ventrals pale rosy; yellow of lower jaw bounded by rosy, rest of jaw and chin whitish; some examples with posterior half of side with scattered small greenish yellow spots, these extending on caudal; eye with a broad brown bar through the middle, white above and below.

Color in alcohol, pale yellowish white, lighter below; body, especially posteriorly, caudal, and soft dorsal with numerous small distinct brown spots; head pale, a white line extending along upper edge of maxillary and across cheek to opercular opening; a similar but less distinct white line from eye to upper edge of gill-opening; between these 2 a few white specks; all the fins, except caudal and soft dorsal, plain yellowish white.

Four specimens of this interesting and handsome species were obtained by us, 2 at Honolulu and 2 at Hilo. Four others are in the collection made at Honolulu in 1898 by Dr. Wood, where it was also obtained by the *Albatross* in 1902.

Pikea lunulata, Steindachner, Sitzb. Ak. Wien, LXX, 1, 375, 1874, and Denks. Ak. Wiss. Wien, XLVII, 1883, pl. VI, fig. 2; not *Grystes lunulatus* Guichenot, in Maillard, App. C, 4, Reunion, 1862, *Indian Ocean*.

Pikea aurora Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 176, Hilo; Jenkins, op. cit. (Sept. 23, 1903), 449 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Genus 125. CEPHALOPHOLIS Bloch & Schneider.

This genus is close to *Epinephelus*, from which it is distinguished mainly by the presence of 9 instead of 11 (or rarely 10) dorsal spines.

Cephalopholis Bloch & Schneider, Syst. Ichth., 311, 1801 (*argus*).

Bodianus Cuvier, Règne Animal, Ed. I, II, 276, 1817. Gill, Proc. Ac. Nat. Sci. Phila. 1862, 237 (restricted to *guttatus*, etc.); not of Bloch.

Uripheaton Swainson, Nat. Hist. Class. Fishes, II, 202, 1839 (*phaton*).

Enneacentrus Gill, l. c., 1865, 105 (*ouatalibi = fulvus*).

Menephorus Poey, Ann. Lyc. Nat. Hist. N. Y., X, 1869, 50 (*dubius*).

171. *Cephalopholis argus* Bloch & Schneider. Fig. 88.

Head 2.75 to 3.25; depth 2.75 to 3; D. ix, 15 or 16; A. iii, 9; scales 9 or 10-100-33, 50 to 55 pores.

Body moderately elongate, the head rather pointed; mouth large, the lower jaw strongly projecting; maxillary extending considerably beyond eye, its tip rather wider than eye, its length 2 in head; preopercle very finely serrate, the serræ scarcely enlarged on the rounded angle; middle opercular spine never lower than upper, lower not so far back as upper; opercular flap pointed; scales of head cycloid, scales of body strongly ciliated; snout and maxillary scaly; teeth in broad bands, canines moderate; gill-rakers 8 or 9, besides rudiments below angle of arch, nearly as long as gill-fringes; third and fourth dorsal spines longest, about 3.5 in head, much shorter than soft rays; pectoral 1.8 in head; ventral 2.25, not reaching vent; second and third anal spines subequal, shorter than soft rays; caudal rounded.

Color dark purplish brown, paler posteriorly, with very faint paler and darker cross shades toward the tail; head, body, and fins covered with small blue spots ringed with black; anteriorly the spots form rows running backward and upward; below they form irregular longitudinal lines; spinous dorsal edged with bright orange; soft dorsal, anal, and caudal edged with whitish.

This species is common about the coral reefs in the south seas. It is recorded from Hawaii by Quoy and Gaimard, but no later observer has found it about these islands. Our description is taken from specimens from Samoa.

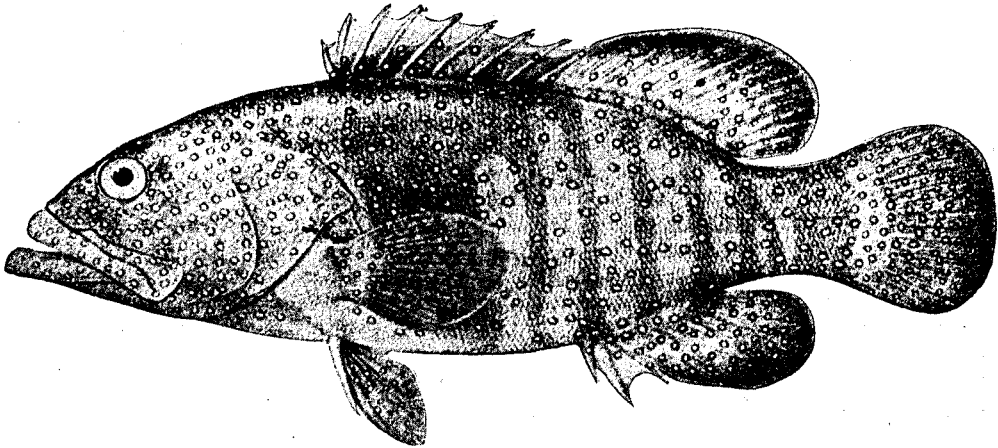


FIG. 88.—*Cephalopholis argus* Bloch & Schneider; after Günther.

- Bodianus guttatus*, Bloch, *Ausl. Fische*, IV, 36, Pl. CCXXIV, 1790; not of Linnaeus.
Cephalopholis argus Bloch & Schneider, *Syst., Ichth.* 311, 1801, India.
Serranus argus, Cuvier & Valenciennes, *Hist. Nat. Poiss.*, II, 360, 1828; Günther, *Cat.*, I, 115, 1859 (East Indies); Peters, *Mon. Berl. Ac.* 1865, 103.
Serranus myriaster Cuvier & Valenciennes, *op. cit.*, 365, Sandwich Islands; Rüppell, *Atlas Fische roth. Meer.*, 107, Pl. XXVII, fig. 1, 1828; Lesson, *Voy. Coquille, Zool.*, 234, Pl. XXXVII, 1828 (Indian Ocean; Borabora); Quoy & Gaimard, *Voy. Astrolabe, Poiss.*, 653, Pl. III, fig. 1, 1833 (New Guinea); Richardson, *Rep. Ichth. China*, 233, 1846, in *Rept. 15th meeting British Assoc. Adv. Sci.*, 1845 (Sandwich Islands; Polynesia; New Guinea; Australia; China and Red Sea).
Serranus guttatus, Günther, *Cat.*, I, 119, 1859; Kner, *Novara, Fische*, 22, 1865; Klunzinger, *Verh. Zool. Bot. Ges. Wien*, XX, 1870, 686; Günther, *Fische der Südsee*, 5, Pl. IV, 1873; Macleay, *Proc. Linn. Soc. N. S. W.*, V, 1880, 315 (North coast of Australia); Klunzinger, *Fische roth. Meer.*, 3, 1884.
Epinephelus guttatus, Bleeker, *Nederl. Tijdschr. Dierk.*, I, 1863, 232 (Isle Ternate).
Epinephelus argus, Bleeker, *Verh. Akad. Amst.*, XIV, No. 2, 1874, 57 (East Indian Archipelago); *Atlas Ichth.*, VII, 43, Pl. CCCXLI, fig. 3, 1876; Sauvage, *Hist. Madag., Poiss.*, in Grandidiers *Hist. Phys. Nat. et Polit. Madagascar*, XVI, 1891, 54.
Serranus guttatus, Day, *Fish. Ind.*, 24, Pl. VI, fig. 3, 1875, and *Fauna Ind., Fish.*, I, 457, 1889, part.
? *Serranus perguttatus* De Vis, *Proc. Linn. Soc. N. S. W.*, VIII, 1883, 445, New Hebrides.
Epinephelus miniatus, Sauvage, *op. cit.*, 52, part.

Genus 126. EPINEPHELUS Bloch. The Groupers.

Body stout, compressed, covered with small, ctenoid scales, which are often somewhat embedded in the skin; scales of lateral line triangular, cycloid; soft parts of vertical fins generally more or less scaly; cranium narrow above; parietal crests not produced on frontals, which are without transverse ridge posteriorly; frontals with a process or knob on each side behind interorbital area; premaxillary processes fitting into a notch or cavity on anterior end of frontals; preopercle moderately serrate behind, its lower limb entire, without distinct antrorse spine; opercle with two strong spines; nostrils well separated; mouth large, maxillary large, with a well-developed supplemental bone, its surface usually with small scales; canine teeth few, large, in the front of the jaws; enlarged teeth of inner series of each jaw depressible; gillrakers short and rather few; dorsal spines usually 11, rarely 10, not filamentous, the last ones somewhat shorter than middle ones; anal spines 3, the second usually the larger; the number of soft rays 7 to 9; caudal fin rounded or lunate; pyloric coeca few (usually 10 to 20);

pectoral rounded, shortish, nearly symmetrical, of 15 to 20 rays; ventrals moderate, inserted below pectoral, close together, each with a strong spine. Species very numerous, most of them of large size, abounding in all the tropical seas, where they are valuable food-fishes. This is the largest and most important genus of the *Serranidae*, and its species are most widely distributed.

Only one species known to occur among the Hawaiian Islands.

Epinephelus Bloch, Ichthyologia, 1793 (*marginalis*, *brunneus*, *merra*, *ruber*, etc.; restricted to *marginalis* by authors).

Cerna Bonaparte, Intr. Classe Pesci, Fauna Italica, III, pt. 1, 1833 (*gigas*=*guaza*).

Cymnichthys Swainson, Nat. Hist. Class. Fishes, II, 201, 1839 (*flavo-purpuratus*),

Cromileptes Swainson, l. c. (*gigas*, etc.).

Hyporthodus Gill, Proc. Ac. Nat. Sci. Phila. 1861, 237 (*flavicauda*=*niveatus*).

Schistorus Gill, l. c. (*mystacius*).

Labroperca Gill, op. cit., 1863, 80 (*labriformis*).

Merus Poey, Ann. Lyc. Nat. Hist. N. Y., X, 1871, 39 (*gigas*).

Priacanthichthys Day, Proc. Zool. Soc. Lond. 1868, 193 (*maderaspatisis*: young).

Homalagrystes Alleyne & McCleay, Proc. Linn. Soc. New South Wales, 1, 1876, 268, Pl. VI, fig. 3 (*guntheri*).

Hyposerranus Klunzinger, Fische des rothen Meeres, 3, 1884 (*morrhua*).

172. *Epinephelus quernus* Seale. "*Hapū'u piū'u*." Figs. 89 and 90 (juv).

Head 2.4 in length; depth 2.6; eye 7 in head; snout 3.6; maxillary 2; interorbital 4.65; D. xi, 15; A. iii, 9; about 130 scales in lateral line.

Body short, deep, and moderately compressed, back considerably elevated, the curve from tip of snout to caudal peduncle being quite uniform, somewhat more abrupt at origin of spinous dorsal; head large; snout moderate, pointed; mouth large at an angle of about 45°, the lower jaw slightly projecting, the tip rounded; maxillary strong, reaching posterior edge of orbit; supplemental bone

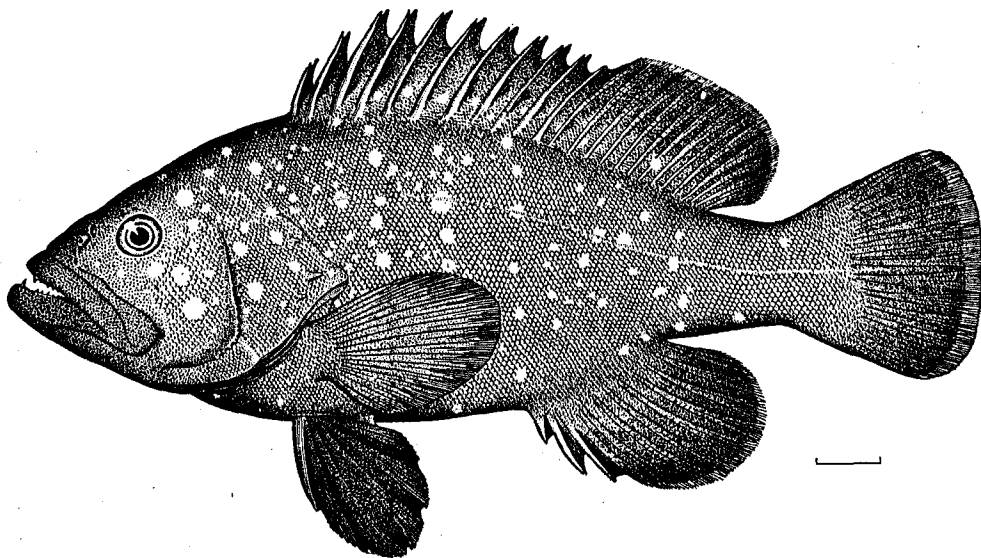


FIG. 89.—*Epinephelus quernus* Seale.

present, width of tip about equaling diameter of eye; teeth in cardiform bands in jaws and on vomer and palatines, the outer row on jaws somewhat enlarged and canine-like, depressible, especially the inner series, 2 or more larger canines near tip of each jaw; tongue without teeth; eye small, in anterior half of head, and entirely above axis of body; interorbital space convex, rather broad, about half greater than eye; nostrils close together, the posterior the larger, vertically ovoid; preopercle serrate, strongest at the angle; opercle with a long, pointed soft flap and 3 flat spines, the middle the largest, closer to the lower than to the upper, lower edge of opercle serrate, branchiostegals 7; gillrakers short and stout, very blunt on short arm, 7+16; pseudobranchiæ well developed; tongue long and

pointed, spoon-shaped, free along the sides and for a distance at tip greater than orbit; fins large; origin of dorsal from tip of snout about equaling length of head; dorsal spines strong, fourth and fifth longest, 2.6 in head; last dorsal spine slightly longer than snout, soft portion of dorsal somewhat elevated, rounded, the longest rays equaling snout and eye; caudal slightly rounded, the rays 1.9 in head; first anal spine short, second strong, third longest, about equaling snout; soft portion of anal rounded, the longest ray 2.25 in head; ventrals scarcely reaching vent, 1.9 in head; pectoral broad, rounded, fan-shaped, about reaching vertical at vent, length of fin 1.75 in head; scales very small, and finely ctenoid; lateral line following curve of back, pores small; nape, opercles, and cheek densely covered with fine scales, anterior portion of interorbital and snout naked.

Color in life, nearly uniform dark-purplish brown, the fins darker on distal portions, the belly also darker; a dark shade above maxillary; irregular pearly white spots on side, arranged partly in vertical rows, the largest less than pupil, the smallest mere dots; head, nape, and whole dorsal fin more or less spotted; caudal broadly, soft dorsal and anal narrowly, edged with whitish; ventrals black; pectorals plain brown. In old examples the white spots become diffuse and disappear, the body becoming leather color, with paler blotches.

Color in alcohol, rich dark brown on head and body, sparsely covered with bluish white spots and specks; similar spots on spinous dorsal; anal and spinous dorsal narrowly edged with dirty white;

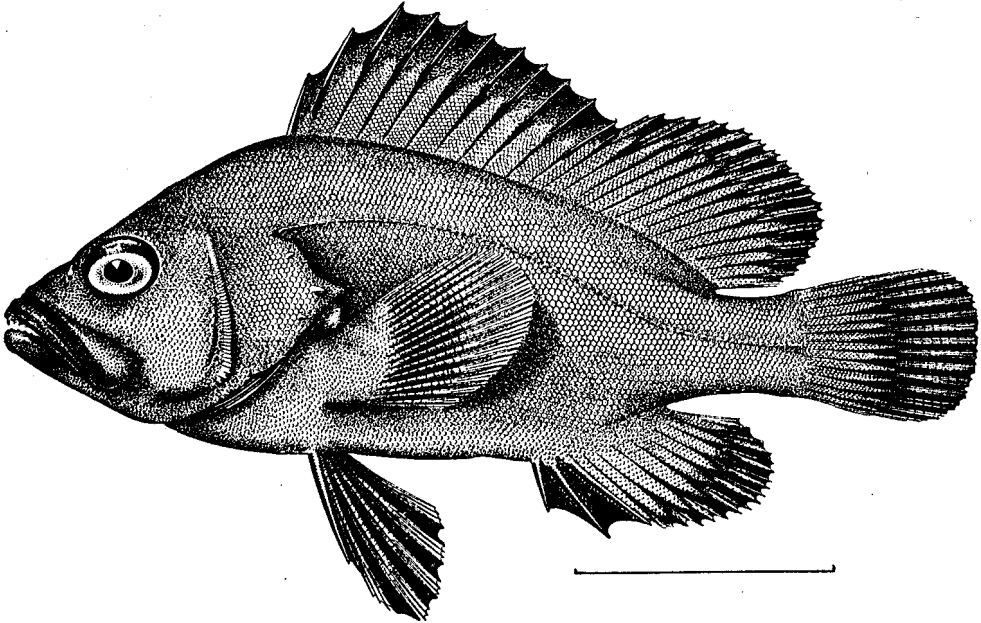


FIG. 90.—*Epinephelus quernus* Seale: from the young.

caudal darkest distally, with a broad, pale border; ventrals blue-black; pectoral smoky, paler on distal portion.

This species is rather scarce in the Hawaiian markets, where very large examples, 2 to 3 feet long, are occasionally seen. Our collection contains 4 specimens, none of them full grown, from one of which—No. 03381, 15½ inches long—our life-color notes were made. This was obtained in the Honolulu market June 16, 1901, at which time 2 other specimens were obtained by us. We have 1 from Kailua, and there are 2 specimens in the collection of Dr. Jenkins obtained by Dr. Wood in 1898. The single specimen obtained by Mr. Alvin Seale, and upon which his description of the species is based, was secured by him August 9, 1901. The species was also obtained by the *Albatross* at Honolulu. Our specimens range in length from 3.75 to 16.5 inches.

There is a specimen of *Epinephelus* in the Philadelphia Academy (No. 13463, Coll. Dr. J. K. Townsend) that is probably this species. It was wrongly identified with *E. fuscoguttatus* (Forskål) by Mr. Fowler.

Epinephelus fuscoguttatus, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 502 (Honolulu); not of Forskål.

Epinephelus quernus Seale, Occasional Papers, Bernice Pauahi Bishop Museum, Vol. I, No. 4, 1901, 3, with plate, Honolulu (Type, No. 481, B. P. B. M., Coll. A. Seale); Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 449 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Genus 127. ODONTANTHIAS Bleeker.

Body strongly compressed; scales rather large, ciliated, smooth; lateral line complete, the tubes straight and extending along nearly the entire scale; mouth rather large, protractile; maxillary exposed; jaws with villiform teeth and curved canines; large, elongate patches of teeth on vomer, palatines, and tongue; head scaly, including the maxillary; preopercle serrated, without antrorse teeth on the lower border; opercle with 3 spines; gill-membranes separate; 7 branchiostegals; pseudo-branchiæ present; gillrakers very long and slender; a single dorsal fin with x, 13 rays, the spinous portion a little longer than the soft; anal short, with III, 7 rays; caudal emarginate; pectoral obtuse-pointed, subsymmetrical, rays 17; ventrals below pectorals, close together, each with a strong spine.

Odontanthias Bleeker, Nederl. Tijdschr. Dierk., IV, 1872, 235 (*Anthias borbonius*).

173. *Odontanthias fuscipinnis* (Jenkins). Plate XV and fig. 91.

Depth 2.5 in length; head 2.8; D. x, 17; A. III, 7; scales, 4-47-15; P. 1.31 in head; V. about equal to head; eye 4 in head; interorbital slightly wider than eye; maxillary reaching to below middle of eye; narrowest part of preorbital a little less than 2 in eye; branchiostegals 7; gillrakers on lower arm of first branchial arch 34.

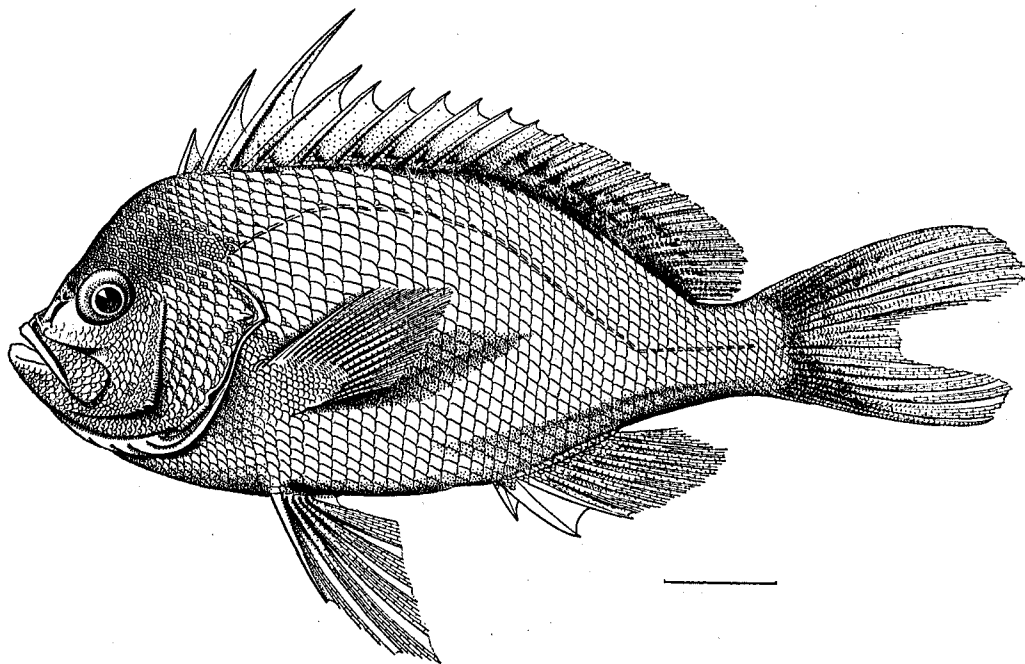


FIG. 91.—*Odontanthias fuscipinnis* (Jenkins). Type of *Anthias fuscipinnis* Jenkins.

Mouth very oblique, lower jaw somewhat projecting, just entering profile; upper profile of head reentrant before the nostrils, thence to nape steep and almost straight, in one specimen rather prominently convex before the eyes; strongly bulging at nape in front of dorsal spines; profile of back straight from front of first dorsal to anterior rays of soft dorsal, from here descending to caudal peduncle, the upper edge of which is on a level with tip of snout; ventral profile less convex and less angular than upper; opercle with 2 flat spines, the upper the larger; lower part of edge of opercle serrated; angle

of preopercle with 1 or 2 small spines; both vertical and horizontal margins of preopercle serrated; preorbital entire, edge of suborbital hidden by scales; teeth in sides of jaw minute, in villiform bands; 2 small canines in front of upper jaw, 2 to 6 in front of lower jaw; first dorsal spine short, less than eye; second more than twice as long as first; third nearly twice second, prominently longer than the succeeding spines; fourth spine 1.66 in the third; spines from fourth to tenth decreasing regularly in length, tenth 1.25 in fourth; soft dorsal somewhat rounded, longest rays equal to fifth spine; first anal spine a little shorter than first dorsal; third anal spine equal to second dorsal, slender and a little longer than second anal spine; soft anal short, medium rays longest, a little longer than longest rays of soft dorsal; caudal rather large, deeply forked, longest rays equal to length of head, longer than longest dorsal spine, lower lobe a little smaller than upper; ventrals longer than pectorals, about equal to head, acute, second ray longest; pectorals pointed, median rays longest; all parts of the head and body except the preorbital and jaws scaled; scales ctenoid and ciliated; lateral line strongly arched anteriorly, beginning above upper end of gill-cleft on eighth scale below the dorsal spines, the highest part on the fourth row from the back and on the twentieth from the ventral median line.

Color when fresh (No. 03461) orange-red, side and back nearly bright golden; tail and breast shaded pink; a golden stripe from eye to tip of snout, bordered all around by crimson, the crimson lines meeting across snout; lower lip crimson; chin golden; dorsal spines golden, their bases olive, the membranes mostly crimson; distal half of soft dorsal golden; a crimson stripe along base of dorsal, same shade covering most of lower half of fin except as replaced by dark olive-green, which forms a stripe above the crimson stripe and irregular blotches above that, leaving 2 irregular rounded spots of the crimson ground color within the green; an olive-green cross blotch at base of tail; caudal golden at tip, middle pink, outer rays bright crimson, basal half of fin mostly scarlet, the orange and red irregularly placed; pectoral shaded in gold and orange; ventrals and anal same, spines pinkish; iris golden, ringed by purple.

Color in alcohol, plain reddish yellow (red in life), dusky on scaly part of base of soft dorsal and of posterior part of spinous dorsal and about base of caudal. Color in life pale orange-red, the dark areas clear olive-green.

This species was obtained at Honolulu (Jenkins, Wood, Jordan and Evermann, and the *Albatross*), Hilo, and Kailua. It is taken in rather deep water, and is at times common in the Hilo market. Our numerous specimens are 7.5 to 9.5 inches in length.

Anthias fuscipinnis Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (June 8, 1901), 389, fig. 3, Honolulu (Type, No. 49695, U. S. Nat. Mus., Coll. O. P. Jenkins); Jenkins, op. cit., XXII, 1902 (Sept. 23, 1903), 450 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Genus 128. PSEUDANTHIAS Bleeker.

Scales small; jaws scaled; lateral line sharply angulated at base of caudal peduncle; no teeth on tongue.

Pseudanthias Bleeker, Poiss. Réunion et Madagascar, in Ned. Tijds. Dierk., IV, 1873, 94 (*pleurostomia*).

174. *Pseudanthias kelloggi* (Jordan & Evermann). Fig. 92.

Head 2.5 in length; depth 2.5; eye 4.5 in head; snout 3.6; maxillary 2; interorbital 5.4; D. xi, 15; A. iii, 7; P. 15; scales 4-36-10; gillrakers 16+4.

Body short, deep, and compressed; dorsal outline greatly arched, profile from origin of spinous dorsal to tip of snout nearly straight, being gently concave over interorbital space; ventral outline nearly straight; caudal peduncle compressed, its greatest depth 3 in head; head longer than deep; snout bluntly pointed, lower jaw prominent, slightly the longer; mouth large, nearly horizontal; a narrow band of small, sharp, conic teeth on palatines, a small patch on vomer, a band of cardiform teeth on upper jaw, a narrower band in lower jaw; several large canine teeth in each jaw anteriorly, 3 of these close together on middle of each side of lower jaw, these hooked backward; 6 or 8 large pores on lower side of mandible and several on upper part of snout; maxillary reaching to posterior edge of orbit, its greatest width 1.5 in eye; edge of preopercle above angle and edge of opercle below the upper middle of base of pectoral denticulate; 2 broad opercular spines, the upper the larger; eye anterior, its lower edge on line with upper base of pectoral; fins large, the second soft dorsal ray and

upper rays of upper caudal lobe being produced each as a filament, the dorsal filament being produced half its length beyond rest of fin; dorsal spines stout and strong, the first spine 2.3 in third, the fifth being the highest, 2.5 in head; base of spinous dorsal 1.15 in head; base of soft dorsal 2.3 in head, its fourth ray 3.5 in head, the last ray 1.4 in fourth; caudal truncate, the lower rays produced slightly as a filament, but not nearly so long as the upper lobe; second anal spine longest, 2.5 in head; second soft ray longest, 2 in head; pectoral very long and large, reaching to origin of soft anal, the eighth and ninth rays from above the longest, 1.4 in head; scales large, finely ctenoid, in regular series; entire body and head scaled; basal portion of all fins except spinous dorsal with small scales; lateral line

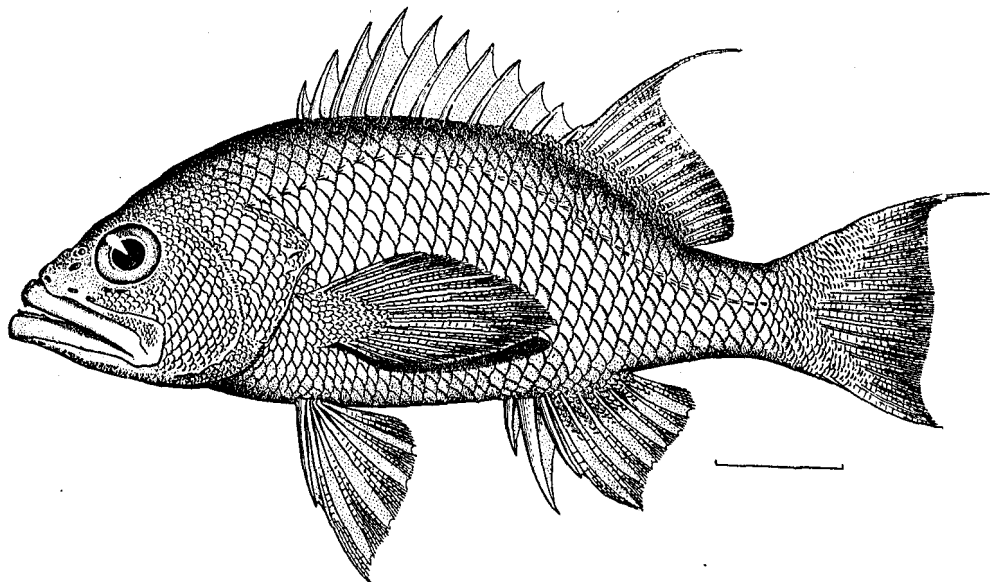


FIG. 92.—*Pseudanthias kelloggi* (Jordan & Evermann); from the type.

strongly convex, not concurrent with the dorsal profile, becoming straight on middle of caudal peduncle; one row of scales behind tip of last dorsal ray.

Color in alcohol, pale brown, the fins lighter; in life, red.

Only 3 specimens were obtained, all having been taken with the hook in deep water off Kailua, in southwestern Hawaii. They range in length from 7.75 to 8.5 inches. The species is allied to *Pseudanthias japonicus* (Steindachner & Döderlein).

Anthias kelloggi Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 179, off Kailua, Hawaii. (Type, No. 50642, U. S. N. M.)

Family LXI. PRIACANTHIDÆ.—The Catalufas.

Body oblong or ovate, compressed, covered with small, firm, rough scales; all parts of the body and head, even the snout and maxillaries, being densely scaly, each scale with a more or less developed plate on its posterior border, most developed in the young; head deep; mouth large, very oblique, the lower jaw prominent; villiform teeth on jaws, vomer, and palatine; none on the tongue; premaxillaries protractile; maxillary broad, without supplemental bone, not slipping under the very narrow preorbital, which is usually serrate; no suborbital stay; eye very large, forming about one-half length of side of head; posterior nostril long, slit-like, close to eye; preopercle more or less serrated, one or more strong spines at its angle; opercle very short, ending behind in 2 or 3 points; no barbels; gill-membranes separate, free from isthmus; pseudobranchiæ very large, extending along whole length of opercle; postorbital part of head very short, the opercle small; gills 4, a slit behind the fourth; gillrakers long; branchiostegals 6; lateral line continuous, not extending on caudal; dorsal fin continuous; x, 9 to 15, the spines depressible in a groove; anal II, 9 to 15; soft part long, similar

to soft dorsal, spines strong, ventrals very large, thoracic, 1, 5, close together, in advance of base of pectoral, joined to belly by a membrane which incloses a groove; no axillary process; spine strong; pectoral small, pointed, not symmetrical, of 19 or 20 rays, the upper longest; caudal fin truncate or lunate; spines of fins generally rough, with small serræ; air-bladder large; pyloric cœca few; vertebrae in reduced number, 9 or 10 + 13 = 22 or 23, the first vertebra being very small or absent; transverse process beginning on seventh (sixth) vertebra, the last 2 precaudal bridged across; ribs attached to the transverse processes; epipleurals absent on last 3 precaudal vertebrae; supraoccipital crest very low, continued forward to over front of orbit, where it is joined by the parietal crests; processes of premaxillaries moderate. Carnivorous fishes of the tropical seas, chiefly in deep waters; mostly rose-colored in life. The family is a sharply defined group, not close to any other, but the affinities on the whole seem to be nearest to the *Serranidae* and their tropical allies. Genera 2, species about 10.

Only 1 genus, with 3 species, known from the Hawaiian Islands.

Genus 129. PRIACANTHUS Cuvier.

Scales very small, 80 to 100 in the lateral line; body oblong, more than twice as long as deep; preopercle with a spine at angle; interorbital area externally transversely convex, the cranium itself transversely concave, the elevation being formed of flesh; a conspicuous foramen in the interorbital area; lateral line extending upward and backward from upper angle of gill-opening toward second dorsal spine, below which it changes its course, following outline of back to end of dorsal fin, thence direct to middle of caudal; anal fin rather long, its rays about *iii*, 14; dorsal rays about *x*, 13. Species rather numerous in the tropical seas; 3 known from Hawaii.

Priacanthus Cuvier, Règne Animal, Ed. I, II, 281, 1817 (*macroptalmus*).

a. Scales relatively large, 85 to 90 in lateral line *alalaua*, p. 228

aa. Scales small, 100 or more in lateral line.

b. Scales about 11-100-53; head about 3 in length to base of caudal; interorbital comparatively wide, 3.4 in eye; gillrakers about 20 below angle *cruentatus*, p. 229

bb. Scales smaller, about 12-115-45; head shorter, about 3.4 in length to base of caudal; interorbital narrow, about 4 in eye; gillrakers about 27 below angle *meckii*, p. 231

175. *Priacanthus alalaua* Jordan & Evermann. "*Alalaua*;" "*Alalaua*." Fig. 93.

Head 3.2 in length; depth 2.65; eye 2.4 in head; snout 3.6; maxillary 2; interorbital 3.8; D. *x*, 14; A. *iii*, 15; scales 13-85 to 90-45, 70 pores; Br. 6; gillrakers about 22 on lower arm.

Body short, deep, compressed, ovate; upper profile of head nearly straight; snout very blunt; mandible prominent, produced; mouth very oblique; teeth small, sharp, in bands on jaws, vomer, and palatines; tongue rounded, free in front; maxillary reaching almost to front margin of pupil, its greatest width 2 in eye; edge of preopercle finely serrate, with a sharp, flat, serrated spine directed backward at angle; margins of interopercle, subopercle, and opercle entire; opercle with an obscure flat spine; interorbital space slightly convex; eye very large, its lower edge a little above base of pectoral and in line with axis of body; nostrils small, close together, the anterior with elevated rim; posterior nostril oblong, with broad flap; gillrakers rather slender, about 22 on longer arm of first arch, longest about 3 in eye; origin of spinous dorsal over upper base of pectoral; dorsal spines rather uniform, the longest about equal to orbit; soft portion of dorsal somewhat elevated, rounded, fourth ray 1.7 in head; anal spines rather stronger than those of dorsal, third the longest, 1.1 in orbit; soft portion of anal similar to that of soft dorsal, rays of about equal length; caudal truncate, the middle rays slightly greater than orbit; pectoral short, bluntly pointed, not reaching tip of ventral, length 1.4 in head; ventrals longer, just reaching base of second anal spine, their length 1.2 in head; ventral spine about 1.25 in longest ray, or 1.7 in head; scales small, firm, and rugose, those of lateral line somewhat enlarged; entire head, as well as body, densely scaled; lateral line rising abruptly for 6 or 7 pores from gill-opening, thence concurrent with back to caudal peduncle.

Color in life, silvery, light olive above, somewhat flushed with red in irregular blotches; chin red; spinous dorsal olive-yellowish, especially on edge; ventrals black, rays whitish; fins unspotted. Young of 4 inches in length are dirty gray, browner above, with no trace of red in life; some brown spots along lateral line; fins dusky, anal and ventral darkest; iris a little brownish-red.

Color in alcohol, plain yellowish-white; spinous dorsal and anal somewhat dusky; ventral mem-

branes black, the rays white, other fins pale yellowish-white. In some examples the color is much more flushed with red, especially above; the red paler and more evanescent than in the other species; fins red, unspotted; the spinous dorsal edged with golden; upper lip golden; ventral membrane black, pectoral pale.

There seems to be but little variation in this species; the younger individuals appear to be more brightly colored or with more evident wash of red than was shown in the type. We have 3 speci-

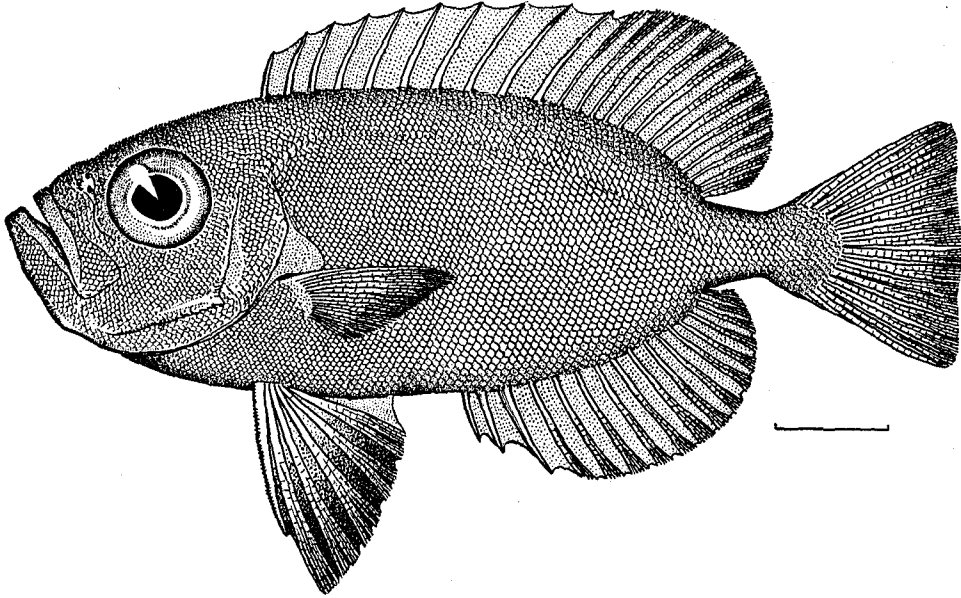


FIG. 93.—*Priacanthus alalaua* Jordan & Evermann; from the type.

mens, 6 to 8.25 inches long, from Honolulu; specimens were also secured by the *Albatross* at Honolulu and at Laysan Island.

Priacanthus alalaua Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 181, Honolulu; Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu; Laysan Island).

176. *Priacanthus cruentatus* (Lacépède). "*Aucoueo*," adult; "*Alalaua*," young; "*Redfish*." Fig. 94.

Head 3 in length; depth 2.6; eye 2.4 in head; snout 3.4; maxillary 2; interorbital 3.4; D. x, 13; A. II, 14; scales 11-100-53, about 80 pores; gillrakers about 20 below angle.

Body oblong, deep, compressed, dorsal and ventral outlines evenly and similarly curved; head about as long as deep, subconic, compressed; snout bluntly pointed; lower jaw very prominent, strong and projecting; mouth moderate, oblique; bands of small, villiform teeth on jaws, vomer and palatines; gillrakers rather long and slender, about 1.5 in pupil, about 20 below angle; tongue broad, rounded and free; maxillary extending to anterior edge of pupil, its greatest width slightly more than 2 in eye; interorbital convex; eye large, its lower edge on a line with axis of body; fins moderate; origin of spinous dorsal over upper base of pectoral, the spines rather short, stout, and blunt, their anterior side rugose; last spine longest, 2.3 in head; soft dorsal rounded, longest ray 1.75 in head; caudal truncate; base of anal 2.75 in body, anterior edge of spines rugose; longest spine 2.6 in head, longest ray 1.9 in head; anterior edge of ventral spine rugose, its length 1.75 in head, longest ray slightly longer than spine, reaching to first anal spine; pectoral short, broad, longest ray 1.9 in head, not reaching as far posteriorly as the ventrals; scales small, very rough, the exposed portion triangular, with a re-entrant angle on anterior side, the posterior edges strongly toothed; lateral line complete, rising abruptly for 4 pores from gill-opening, then turning sharply, following approximately the curvature of the back, a little more distant under soft dorsal, turning in a broad angle at base of caudal peduncle, along the middle of which it follows to base of caudal; preorbital toothed or rugose on both

edges; preopercle strongly toothed, with a strong rugose toothed sharp or blunt spine at the angle, this spine varying much in different individuals; lower edge of opercle toothed.

Another example was bright red in life, mottled with silvery white; dark red color forming about 6 vertical bars on side of back alternating with fainter bars; dorsal and caudal rosy, spotted with blood red, spots small, smallest and most distinct on caudal; pectoral and ventrals rosy; iris without dark spots or dark shading; iris and jaws deep red. In some examples the dark spots are large.

Color in alcohol, plain yellowish white, dusky above, silvery below, fins all yellowish white; spinous dorsal somewhat dusky; soft dorsal, anal and caudal with numerous small dark (blood red) spots on the membranes, their edges narrowly black.

The above description taken chiefly from a specimen (No. 03166) 10.5 inches long from Honolulu.

Color in life (note by Dr. Jenkins), head and body made up of mottlings of bright red and white; iris white with bright red blotches; dorsal mottled with red and white and covered on posterior portion with more or less distinct red; anal similar in color to dorsal; caudal red with rows of distinct darker red spots on membranes; pectoral pale red; ventral white, with red mottlings; inside of mouth white, with bright red blotches.

Color in life (Porto Rican specimens), body silvery, washed with rosy; back with 5 or 6 saddle-like blotches extending on side to below lateral line; under parts rosy; vertical fins with pale bases, brighter distally; caudal black-edged; pectoral and ventral rosy, the ventrals black-tipped.

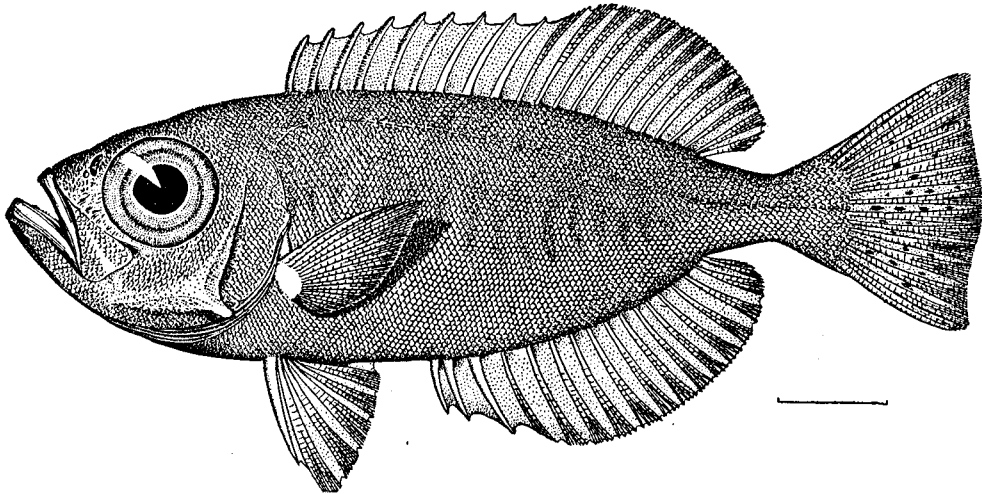


FIG. 94.—*Priacanthus cruentatus* (Lucépède).

We have compared our numerous specimens with others from the Galapagos and West Indies and can detect no differences. The Pacific species, *P. carolinus*, can not be distinguished from the West Indian species, *P. cruentatus*.

This is a species of wide distribution, having been recorded from St. Helena and the Canaries, the West Indies, the Galapagos, and the Hawaiian Islands. In the West Indies it is known as *ojon*, *ojudo*, and *catalufa*. Among the English-speaking people it is called *big-eye*. Streets says of the young:

“During the month of September, 1873, an immense shoal of the young of this species entered the harbor of Honolulu. The largest of them did not exceed 3½ inches in length. This shoaling, we were told, has occurred a number of times, but at uncertain intervals. The coming of the ‘red-fish,’ as they are called, foreshadows in the minds of the simple natives the sickness and death of some member of the royal family; and, on account of the pliant disposition of the Kanakas, the prophecy is usually fulfilled. But the fish are by no means unwelcome visitants to the common people, who are busy catching them night and day as long as they remain. They are dried and eaten without cooking.”

This fish seems to be very abundant among the Hawaiian Islands and is represented in our collections by a fine series of 33 specimens, ranging in length from 4 to 11.75 inches; of these, 7 were

collected by Dr. Jenkins at Honolulu in 1889. Specimens were obtained by us at Honolulu, Hilo, Napoopoo, and Kailua, but none was obtained by the Albatross.

Labrus cruentatus Lacépède, Hist. Nat. Poiss., III, 522, 1801, Martinique.

Priacanthus cepedianus Desmarest, Prém. Dec. Ichtyol., 9, pl. 1, 1823, Havana.

Priacanthus carolinus Lesson, Voyage Coquille, Poiss., 224, 1826, Caroline Islands; Cuvier & Valenciennes, Hist. Nat. Poiss., III, 105, 1829 (Qualand or Strong Island, Caroline Islands); Streets, Bull. U. S. Nat. Mus., No. 7, 72, 1877 (Honolulu).

Priacanthus schlegelii Hilgendorf, Sitzber. Ges. Naturh. 1879, 79, Japan.

Priacanthus cruentatus, Jordan & Evermann, Fish. North & Mid. Amer., I, 1238, 1896; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 450 (Honolulu).

177. *Priacanthus meeki* Jenkins. "Ula lau au." Fig. 95.

Head 3.4 in length; depth 2.8; eye 2.3 in head; snout 3.6; interorbital 4; maxillary 2; mandible 1.8; D. x, 14; A. III, 15; scales 12-115-45; gillrakers 2+27.

Body oblong, compressed, the dorsal and ventral outlines about equally curved; head large, snout blunt, the anterior profile straight from tip of snout to nape; mouth large, very oblique, the lower jaw projecting, its anterior edge in line with profile from snout to nape; maxillary reaching anterior edge of pupil, its tip broad, nearly half eye; teeth on jaws, vomer and palatines in strong villiform bands, many of those on jaw somewhat enlarged; gillrakers rather long, about 2 in eye, their number

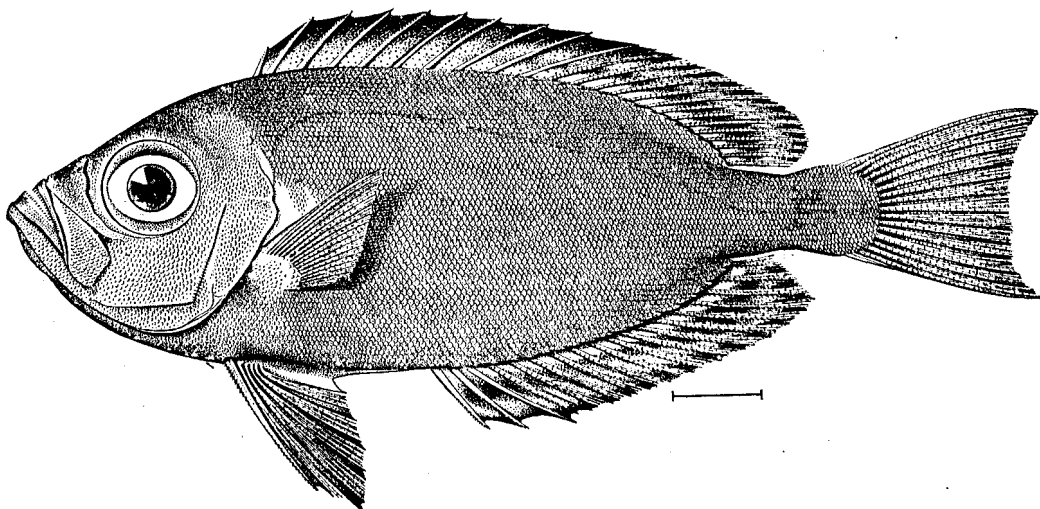


FIG. 95.—*Priacanthus meeki* Jenkins; from the type.

about 2+27; eye very large, its lower edge slightly below axis of body; interorbital space moderate, convex; opercle with a weak flat spine; preopercle serrate, without spine, weak and obscure except in young, where it is better developed; preorbital rough-edged; fins rather large, origin of spinous dorsal over base of pectoral; longest dorsal spine about 1.6 in head, soft portion of dorsal rounded, longest ray 1.5 in head; longest anal spine 1.8 in head, anal high, longest ray 1.3 in head; caudal rather deeply lunate, outer rays nearly equal to head, the middle ray 1.5 in the outer, upper lobe somewhat the longer; pectorals short, not reaching tips of ventrals, 1.5 in head; ventrals long, pointed, reaching base of third anal spine, 1 in head; scales small and rough, the free portion narrowly lunate, concave anteriorly, the posterior edge roughened; lateral line rising in a regular curve from gill-opening to about the tenth pore, then following contour of back to base of caudal.

Color in life, deep red, darker than any other species of *Priacanthus*, without trace of dark cross-bands or round rosy spots; a row of about 15 roundish dusky spots, very faint along lateral line; fins deep red, unspotted, the dorsal and anal edged with dusky; caudal mesially dusky edged; ventrals with black membranes, pectoral paler rosy; inside of mouth deep orange red.

Color in alcohol, dusky silvery, darkest above, palest on belly; head dusky, snout and lower jaw blotched and spotted with darker; dorsal and anal fins pale, with dusky or black on some of the membranes and narrowly edged with black, in some specimens the black very marked; caudal pale, edged with black; ventrals black at tips; pectorals pale. Smaller examples 4 to 5 inches long are, in spirits, much darker, being dark brown covered with darker coffee-colored specks; all the fins except pectorals black.

The above description is based chiefly upon a specimen (No. 03396) 11.75 inches long, from Honolulu.

This species seems to be close to *Priacanthus hamruhr*, from which it differs chiefly in the greater depth of the body, the color, and much greater length of the dorsal and anal rays, and in the smaller scales. In current descriptions of *P. hamruhr*, the depth of the body is said to be nearly equal to the length of the head; in our specimens it greatly exceeds the length of the head.

This species appears to be an important food-fish at Honolulu and is fairly abundant. Our collections contain an excellent series of 9 specimens from Honolulu and 6 from Hilo. We have also examined the type, taken at Honolulu by Dr. Jenkins, and the 2 cotypes, collected also at Honolulu by Dr. Wood. These specimens range from 4 to 12.5 inches in length.

Priacanthus hamruhr, Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 484 (Honolulu; Laysan); not of Forskål, whose species has scales 75 to 80.

Priacanthus meeki Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 450, fig. 20, Honolulu. (Type, No. 50847, U. S. N. M.; coll. O. P. Jenkins.)

Family LXII. LUTIANIDÆ.—The Snappers.

Body oblong or more or less elevated, covered with moderate-sized adherent scales, which are more or less strongly ctenoid or almost cycloid; lateral line well developed, concurrent with the back, not extending on the caudal fin; head large, the crests on the skull usually largely developed; no suborbital stay; mouth moderate or large, usually terminal, low and horizontal; premaxillaries moderately protractile, their spines not extending to the occiput; maxillary long, without supplemental bone, for most of its length slipping under the edge of the preorbital, which forms a more or less distinct sheath, its form essentially as in the *Serranidæ*; teeth various, unequal and sharp, never incisor-like, some of them sometimes molar; vomer and palatines usually with villiform teeth, these sometimes molar, sometimes very small, sometimes wanting; lower pharyngeals separate; gills 4, a slit behind the fourth; pseudobranchiæ large; gillrakers moderate or long, slender; gill-membranes separate, free from the isthmus; preopercle serrate or entire; opercles without spines; sides of head usually scaly; dorsal fin single, continuous, or deeply notched, sometimes divided into 2 fins, the spines usually strong, depressible in a groove, the spines heteracanthous—that is, alternating, the one stronger on the right side, the other on the left, the spines 10 to 12 in number; anal fin similar to soft dorsal and with 3 spines; ventral fins thoracic, the rays 1, 5, with a more or less distinct scale-like appendage at base; caudal fin usually more or less concave behind; air-bladder present, usually simple; intestinal canal short; pyloric cæca few; vertebræ usually 10+14=24; no distinct tubercles from the cranium for the articulation of the epipharyngeal bones; enlarged apophyses for the articulation of palatine and preorbital bones; anterior 4 vertebræ without parapophyses. This family comprises about 20 genera and some 250 species, chiefly inhabiting the shores of warm regions. All of them are valued as food, and all are active, carnivorous and voracious. The group is closely related to the *Serranidæ* on the one hand, and to the *Hemulidæ* on the other.

Of the many genera of this family only 6 are known to have representatives in Hawaiian waters.

- a. Interorbital not flat nor separated from the occipital region, the median and lateral crests procurent on it, and the frontal narrowed forward.
- b. Teeth on tongue minute or entirely absent.
- c. Teeth on palatines, vomer, and jaws, the outer series on the jaws enlarged and canine-like; preopercle somewhat serrate.....*Apsilus*, p. 233
- cc. No teeth on palatines, vomer, or tongue, those on jaws not enlarged nor canine-like; preopercle entire.
Aphareus, p. 235
- bb. Teeth on tongue strong, as well as on palatines and vomer and both jaws, those on latter somewhat enlarged and canine-like.....*Bowersia*, p. 236
- aa. Interorbital flat, separated by a transverse line of demarcation from the occipital region, by which the median as well as the lateral crests are limited; frontals wide in front.
- d. Dorsal fin continuous.....*Aprion*, p. 238
- dd. Dorsal fin divided, the spinous portion separated from the rays by a deep notch.....*Etelis*, p. 240

Genus 130. *APSilus* Cuvier & Valenciennes. The Arnillos.

Body rather short and stout; teeth on palatines, vomer and jaws in villiform bands, those in outer series on both jaws enlarged and canine-like; no teeth on tongue, or very minute if present; last ray of dorsal and anal much or little produced; preopercle somewhat serrate; interorbital not flat; dorsal fin continuous; branchiostegals 7.

This genus has essentially the cranial structures of *Rhomboplites*, with the scaleless fins, peculiar squamation, and dentition of *Aprion*. The prefrontals have the posterior areas solid and somewhat tumid; the dorsal fin is short and scaleless.

Apsilus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 548, 1830 (*fuscus*).

Tropidinius Gill in Poey, Synopsis, 296, 1868 (*arnillo*=*dentatus*).

a. Body short and stout, the depth 3 in length; scales about 67 *brighami*, p. 233
 aa. Body more slender, the depth about 3.5 in length; scales larger, about 61 *microdon*, p. 234

178. *Apsilus brighami* (Seale). "Ukikiki," *Kalikali*. Plate XVI.

Head 3 in length; depth 3; eye 4 in head; snout 2.75; maxillary 2.3; mandible 2; interorbital 4.1; preorbital 6.75; scales 7-67-15; D. x, 11; A. III, 8; Br. 7; gillrakers short and broad, 11+4, those on shorter arm very blunt except lower one, longest a little greater than pupil.

Body rather short, stout, and moderately compressed; head large, bluntly conic; snout rather long, bluntly pointed; mouth large, slightly oblique; maxillary reaching anterior edge of pupil; lower jaw slightly the shorter; teeth on jaws, vomer and palatines in villiform bands, those in outer series on jaws enlarged and canine-like, the anterior ones largest; tip of maxillary greater than pupil, slipping under the rather broad preorbital; eye moderate, entirely above axis of body; interorbital smooth, convex; opercle ending in 2 flat, weak spines; preopercle serrate; preorbital smooth; caudal peduncle deep, compressed, its least width half its depth, which is equal to snout; fins rather large; origin of dorsal over base of pectoral, midway between tip of snout and base of fifth dorsal ray, first dorsal spine short, about 1.6 in second, fourth and fifth spines longest, a little greater than snout, last dorsal spine slightly shorter than second; last dorsal ray somewhat produced, about 2.25 in head, or a third longer than first ray; first anal spine short, about 1.9 in eye, or 2 in second anal; third anal spine slightly greater than eye; last anal ray equal to last dorsal; caudal moderately forked, lobes about equal, their length 1.25 in head; pectoral rather long, slightly falcate, the tip reaching origin of anal, the length nearly equaling that of head; ventrals long and pointed, reaching slightly past vent, their length 1.4 in head; scales rather small, firm, the lateral line well developed; cheek and opercles scaled; a row of modified plate-like scales from humeral plate to nape, in front of which is a patch of ordinary scales; soft dorsal and anal without scales; caudal finely scaled.

Color in life (from No. 03735), upper half of body with 4 broad yellow bands, last one extending to base of caudal, between these are 3 light red bands nearly as broad as the yellow ones; lower half of body yellow, the edge of scales here tinged with red; head and snout bright golden-red; opercles light red; jaw reddish; upper lip golden reddish, lower reddish; dorsal bright yellow, same as yellow bands on body; margin of soft dorsal tipped with reddish; caudal yellow, with reddish tinge, end yellow, upper and lower edges reddish; anal membrane faint golden red, rays faint red; ventrals pale, tinged with red; pectoral membrane pale, rays light yellow; axil golden reddish.

Color in alcohol, pale yellowish white, pale below, head slightly dusky, fins all pale yellowish white, tips of ventrals slightly dusky.

The life color of the type specimen, as given by Mr. Seale, was as follows: Ground color, pinkish white; 3 distinct wide yellow bands, as wide as interspaces, extending obliquely downward and backward on side of body, the first from the nape to a little posterior of axis of pectoral, the second from third to sixth dorsal spines ending above and anterior to vent on a line with lower base of pectoral, the third from eighth dorsal spine to third dorsal ray ending above and on a line with the fifth to eighth anal rays, behind this last band, above the lateral line, a wash of yellowish reaching to base of caudal; dorsal fin cadmium-yellow; caudal fin yellow, the upper lobe with pink tint; pectoral pinkish; ventrals and anal white; side of head and jaws with a few deeper splotches of pinkish, iris whitish, the pupil deep blue. In spirits the yellow bands fade so that the interspaces show more distinctly than the bands, the color becomes also a deeper pinkish, the fins whitish.

The above description is based chiefly upon a specimen (No. 04110) 15 inches long, obtained by us in Honolulu in the early part of August, 1901; 2 other specimens were obtained by Messrs. Goldsborough and Sindo at Kailua, August 10. A single specimen was obtained by Dr. Jenkins in 1889, and another by the *Albatross* in 1902.

The specimen described by Mr. Seale was obtained by him in Honolulu in October, 1901. The species is a typical *Apsilus*. Mr. Seale's error in placing it in the family *Serranidae* instead of *Lutjanidae* was apparently due to his misinterpretation of the relation of the maxillary to the preorbital. The maxillary is well covered by the preorbital.

This species does not seem to be abundant, but is a good food-fish. It reaches a length of about 1.5 feet, and is an inhabitant of the deeper waters, 2 of the specimens that we have examined having the stomachs everted.

Serranus brighamii Seale, Occasional Papers Bishop Museum, I, No. 4, 7, 1901, Honolulu. (Type, No. 625, B. P. B. M., Coll. A. Seale.)

Apsilus brighamii, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 452 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

179. *Apsilus microdon* (Steindachner). "*Opakapaka*."

Head 3.1 in length; depth 3.5; eye 4 in head; snout 3; maxillary 2.6; mandible 2.1; preorbital 8; interorbital 3.1; Br. 7; gillrakers about 16 + 5; D. x, 11; A. III, 8; scales 8-61-14.

Body moderately short, stout, and compressed; head large, longer than deep; snout bluntly conic; mouth rather large, slightly oblique, the maxillary reaching pupil, slipping for its entire length under the rather broad preorbital, its width at tip equal to diameter of pupil, jaws equal; bands of villiform teeth on jaws, vomer, and palatines, the outer series on jaws scarcely enlarged, scarcely canine-like, except a pair on front of upper jaw; no teeth on tongue; opercle ending in 2 flat, weak spines, the space between them deeply emarginate; preopercle somewhat serrate; eye moderate, its lower edge in line with axis of body; interorbital slightly convex, very broad; caudal peduncle short, its length from base of last dorsal ray to first supporting caudal rays 2.3 in head, its least width about 2.5 in its least depth, which is slightly greater than eye, or 3.6 in head; dorsal fin beginning over base of pectoral, its origin midway between tip of snout and base of fifth ray, distance from origin of dorsal to base of first supporting caudal rays twice length of head; first dorsal spine very short, about 1.7 in pupil, or 3.25 in second spine; fifth dorsal spine longest, about equal to snout; last dorsal ray produced, its length 1.5 times that of preceding ray; origin of anal under base of fourth dorsal ray; first anal spine short, its length about half that of second, anal spines all weak, the third longest, its length slightly less than diameter of eye; produced anal ray similar to that of dorsal; caudal deeply forked, the lobes about equaling length of head; ventrals moderate, not reaching vent, their length 1.6 in head; pectoral somewhat longer, its tip reaching slightly past tips of ventrals, its length 1.25 in head; scales rather small, firm, deeper than long; lateral line well developed, beginning at base of humeral plate and following contour of back to base of caudal; cheek and opercles scaled; a series of modified scales from bony opercular scale to nape, in front of which is a patch of normal scales.

Color in life (No. 03008), back and upper part of side violet brown, with bright reflections; lower part of side and belly silvery; faint brassy stripes separated by obscure bluish ones along middle of side; head color of back; cheek and suborbital silvery, with dusky wash; dorsal purplish, with 3 series of large yellow blotches forming 3 lines; caudal dusky and greenish, the middle rays yellowish; pectoral, anal, and ventrals white; iris greenish yellow.

Color in spirits, dusky or olivaceous brown above, paler on sides and below; belly somewhat dusky; each scale on back and upper part of side with a chocolate-brown triangular area, these forming indistinct longitudinal lines; membrane of dorsal fin dusky purplish, all other fins pale.

The above description based upon a specimen (No. 6081) 10 inches long, collected at Honolulu by Dr. Wood. We have 10 specimens from Honolulu, 1 from Hilo, and 1 from Kailua. Dr. Jenkins had 2 specimens obtained at Honolulu by Dr. Wood, and the species was also found by the *Albatross* at Honolulu. It is known only from the Hawaiian Islands, where it is a common food-fish in the markets, reaching a length of 2 feet.

Aprion microdon Steindachner, Sitzr. Ak. Wiss. Wien, LXXIV, abt. I, 1876, 158, Sandwich Islands.

Apsilus microdon, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 451 (Honolulu).

Platyinius microdon, Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Genus 131. *APHAREUS* Cuvier & Valenciennes.

Body long and slender; vomer, palatines, and tongue without teeth; teeth in each jaw in a narrow, villiform band, none enlarged or canine-like; last dorsal and anal rays much produced; preopercle entire; interorbital convex; dorsal fin not notched; branchiostegals 7.

This genus is related to *Apsilus*, from which it differs chiefly in the dentition.

Aphareus Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 485, 1830 (*carrutescens*).

180. *Aphareus flavivultus* Jenkins. Fig. 96.

Head 3.3 in length; depth 3.4; eye 4.4 in head; snout 3.1; maxillary 1.9; mandible 1.65; interorbital 3.2; preorbital 6.5; Br. 7; gillrakers 16 + 5; D. x, 11; A. III, 8; scales 9-72-17.

Body long and slender, considerably compressed, the dorsal and ventral outlines beautifully curved from tip of snout to caudal peduncle, greatest depth at the origin of dorsal fin; head rather long, conic; snout long; mouth very large, somewhat oblique, the maxillary slipping for its entire length and most of its width under the broad preorbital, reaching posterior border of pupil; lower jaw long and strong, its tip projecting and entering into anterior profile; vomer, palatines, and tongue toothless; teeth in jaws in a narrow, villiform band, none enlarged; eye moderate, its lower border in line with axis of body; opercle smooth, without developed spines; preopercle not dentate, only slightly

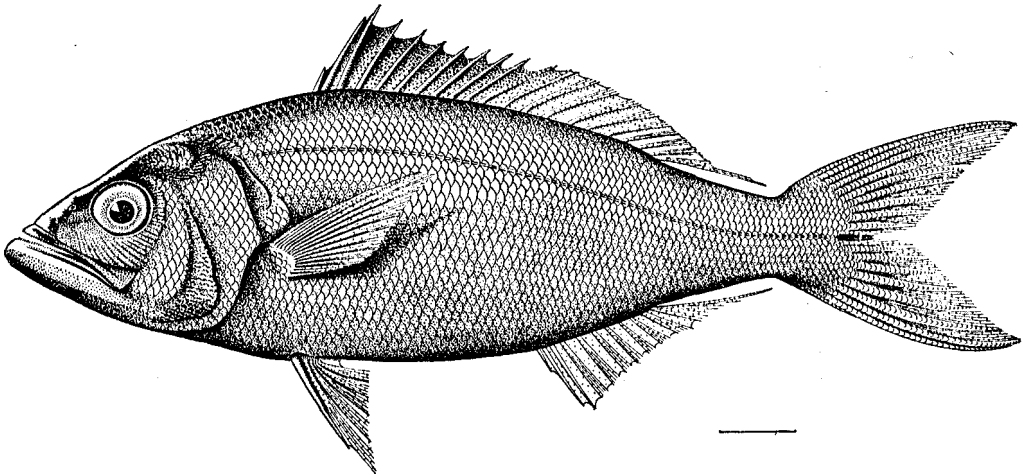


FIG. 96.—*Aphareus flavivultus* Jenkins: from the type.

crenulate; caudal peduncle long, its length from base of last dorsal ray to base of first supporting caudal rays equal to snout and eye, its least width about 2.5 in its least depth, which is slightly less than snout; fins small, the dorsal continuous, its origin slightly behind base of pectoral and equidistant between tip of snout and base of seventh soft ray; third dorsal spine longest, slightly greater than snout; last dorsal ray produced, its length about 2.4 times that of preceding ray; anal similar to soft dorsal, its origin under base of about fourth dorsal ray; third anal spine longest, slender, its length 3.8 in head; last anal ray much produced, its length equal to that of last dorsal ray; caudal widely forked, the lower lobe slightly the longer, its length somewhat greater than that of head; ventrals rather pointed, not nearly reaching vent, about 1.75 in head; pectoral long, somewhat falcate, upper rays produced, about 1.2 in head; scales small, moderately firm, covering entire body, nape, cheek, and opercles; a modified humeral scale from which a line of modified scales extends to occiput, in front of which is a patch of ordinary scales; scales on cheek in 6 rows, those on opercle in 9 rows; lateral line beginning at lower edge of humeral scale, very slightly arched, following closely curvature of back to base of middle caudal ray; soft dorsal and anal naked; caudal with fine scales.

Color in life, dirty violet, edges of scales brownish; lower side and under parts somewhat paler; head dirty violet or purplish; dorsal brownish red at base, yellowish olive and rosy on outer half; caudal greenish olive, edged with reddish purple; anal white at base, somewhat dusky, a large brassy

yellow blotch on anterior part of fin, posteriorly dirty rosy; ventrals purplish and greenish yellow; pectoral pale rosy; iris yellowish rosy white.

This species is not common among the Hawaiian Islands, only 11 specimens having been obtained in that region by collectors. It differs from *Aphareus furcatus* in form and otherwise.

According to Dr. Jenkins, the color of the top of the head was very distinct in life in the examples obtained by him in 1889. None of our specimens showed any yellow on the face. An examination of Dr. Jenkins's specimens shows that this color has entirely faded, so that no character remains by which his specimens can be distinguished from ours.

Besides the 5 specimens from Honolulu and Kona, Hawaii, in Dr. Jenkins's collection, we have 2 from Honolulu, 2 from Kailua, and 1 from Hilo. One was also obtained by the *Albatross* at Honolulu. The species is known only from the Hawaiian Islands.

Length 4.5 to 15 inches.

Aphareus flavivultus Jenkins, Bull. U. S. Fish Comm., XIX, 1899 (June 8, 1901), 390, fig. 4, Honolulu. (Type, No. 49691, U. S. N. M., Coll. O. P. Jenkins); Jenkins op. cit., XXII, 1902 (Sept. 23, 1903), 451 (Kona, Hawaii); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Aphareus furcatus, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 451 (Honolulu).

Genus 132. BOWERSIA Jordan & Evermann.

Body long, rather slender and moderately compressed; top of head evenly rounded, the supra-occipital crest extending forward on cranium; jaws equal, lower not projecting; bands of villiform teeth on both jaws, the outer series somewhat enlarged and canine-like; villiform teeth on vomer, palatines, and tongue; maxillary slipping for its entire length under the rather broad preorbital; eye large; opercle entire, ending in 2 flat, obscure spines, the space between them deeply emarginate, but filled by soft membrane; preopercle scarcely dentate; dorsal fin continuous, the last ray produced, nearly twice length of preceding one.

This genus is related to *Apsilus*, with which it agrees in the presence of villiform teeth on the vomer and palatines, but from which it differs in having well-developed teeth on the tongue, and in the produced last dorsal and anal ray. Two species are known.

"We take much pleasure in naming this new genus for the Hon. George M. Bowers, United States Commissioner of Fish and Fisheries, in recognition of his active and intelligent interest in promoting scientific work, especially the investigation of the aquatic resources of the Hawaiian Islands."

Bowersia Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 182 (*violascens*).

a. Scales rather large, about 60 in lateral line; preorbital broad, 7.75 in head.....*violascens*, p. 236
aa. Scales smaller, about 68 in lateral line; preorbital narrow, 10 in head.....*ulaula*, p. 237

181. *Bowersia violascens* Jordan & Evermann. "*Opakapaka*." Fig. 97.

Head 3.25 in length; depth 3.5; eye 4.4 in head; snout 3; maxillary 2.6; mandible 2; interorbital 3; preorbital 7.75; scales 8-60-15; D. x, 10; A. III, 8; Br. 7; gillrakers 5 + 14.

Body long, rather slender, moderately compressed, tapering gradually into the rather long caudal peduncle; head large, longer than deep; snout moderate, rather bluntly conic; mouth large, maxillary reaching anterior third of pupil, slipping for its entire length under the thin edge of the rather broad preorbital, the width of its tip 2 in eye; mandible strong, but not projecting; broad bands of villiform teeth on jaws, vomer, palatines, and tongue, the outer series in the jaws slightly enlarged and canine-like; eye large, its lower edge in line with axis of body; interorbital broad, gently convex; anterior profile but slightly curved from tip of snout to nape, thence more strongly arched to origin of dorsal, descending in a long, low curve to caudal peduncle; ventral outline but slightly convex; caudal peduncle rather long, 2 in head, its least width about 1.6 in its least depth, which is 1.8 in its length, measured from base of last dorsal ray to base of supporting caudal rays; gillrakers few, rather strong and short, the longest about 2.6 in eye; opercle smooth, ending in 2 flat, obscure spines (more strongly developed in each of the cotypes); preopercle obscurely serrate at the angle (more distinctly so in the cotypes); fins moderately developed, the dorsal fin continuous, without notch, its origin over base of pectoral and equally distant from tip of snout and base of fourth ray, length of entire base of fin and to tip of last ray twice length of head; first dorsal spine moderately short, closely bound to the second, whose length exceeds it by about one-half; seventh dorsal spine longest, its length equal to that of

snout; last dorsal ray produced, its length about 1.7 times that of the preceding; anal similar to soft dorsal, its origin under base of third or fourth dorsal ray; first anal spine very short, third longest and strongest, its length equaling diameter of eye; last anal ray produced, its length equaling that of produced dorsal ray; caudal rather widely forked, lobes about equal, their length, measured from base of first supporting ray, equaling head; ventrals pointed, their tips not reaching vent, length 1.4 in head; pectoral long, slightly falcate, the tip about reaching tips of ventrals, its length about 1.2 in head; scales large, deeper than long and rather loose; cheek and opercles scaled, 5 rows on cheek; a large bony humeral scale, from which extends to nape a series of somewhat modified scales, in front of which is a patch of ordinary scales; lateral line complete and well developed, beginning at lower edge of humeral scale and following curvature of back to base of middle caudal rays; the pores little or not at all branched.

Color in life (field No. 03404), light rosy olive, with violet shades, pale below; center of each scale of back shining violet; dorsal reddish flesh-color, its base anteriorly yellowish olive; caudal flesh-color, rosy along the edges; anal similar, its edge light lavender gray; ventrals pale, shaded with light orange; pectoral flesh-color, violaceous at base; snout violet, iris light yellow. A flesh-colored vio-

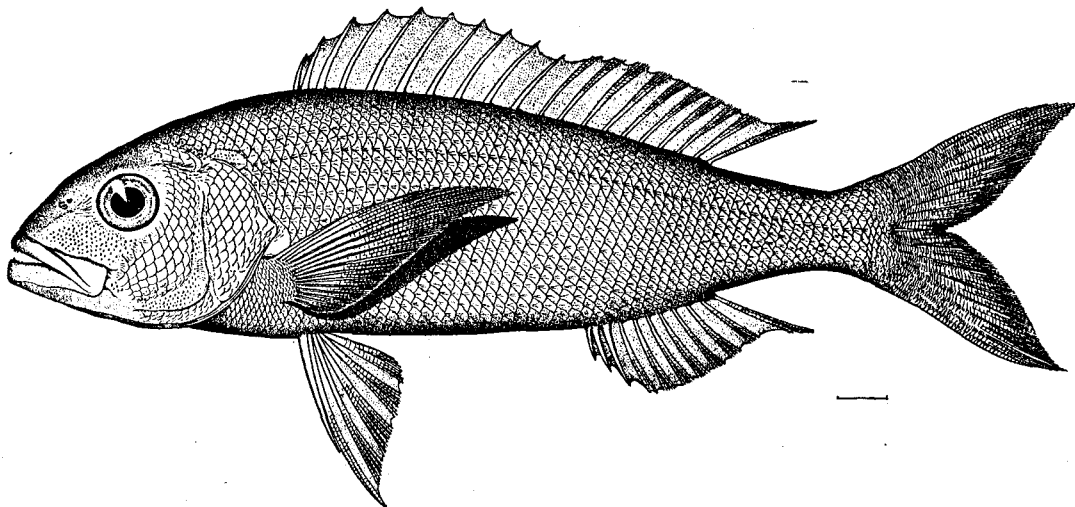


FIG. 97.—*Bowersia violescens* Jordan & Evermann; from the type.

laceous fish without color markings anywhere. Another specimen (field No. 03417) freshly dead, had the body, head, and caudal light rosy; ventrals white; outer margin of spinous dorsal golden, the membranes with irregular golden areas; pectoral and anal not distinctly colored; iris yellow.

Color in alcohol of type (field No. 03018), above dusky silvery, bases of scales brown; sides and under parts silvery, with pale greenish-yellow tinge; top of head somewhat olivaceous, sides rusty silvery; axil of pectoral dusky; fins all pale or yellowish-white.

This species reaches a length of about 2 feet and is an important food-fish.

Our 4 specimens, all from Honolulu, are each about 2 feet in length.

Bowersia violescens Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 183, Honolulu.

182. *Bowersia ulaula* Jordan & Evermann. "Ulaula;" "Kō'ē." Fig. 98.

Head 3.6 in length; depth 3.8; eye 3.8 in head; snout 3.8; maxillary 2.9; mandible 2.4; inter-orbital 3.6; preorbital 10; scales 8-68-14; D. x, 11; A. iii, 8; Br. 7; gillrakers 21 + 5.

Body long and slender, the dorsal outline in a low, gentle curve from tip of snout to base of caudal, the ventral outline but gently convex; head moderate, bluntly conic; snout rather short; mouth moderate, somewhat oblique, the jaws equal; maxillary moderate, slipping for its entire length under the narrow, thin preorbital, its width at tip 2.8 in eye; bands of villiform teeth on vomer, palatines, tongue and jaws, those of outer series in the latter scarcely enlarged; opercle ending in 2 obscure, flat spines,

the space between them deeply emarginate but filled by membrane; preopercle rather distinctly serrate, the teeth very short; eye rather large, its lower border in line with axis of body; preorbital very narrow, much narrower than in *B. violescens*; interorbital space narrower than in the preceding species, slightly convex; caudal peduncle long, its length from base of last dorsal ray to first supporting rays of caudal 1.7 in head, its least width about 2.1 in its least depth, which is 2.1 in its length; gillrakers rather numerous, close-set, the longest about 2.2 in eye; fins moderately developed, the dorsal continuous, without notch, its origin slightly behind base of pectoral and equally distant between tip of snout and base of fifth or sixth dorsal ray; head 2 in distance from origin of anal to middle of last dorsal ray; first dorsal spine rather short, about 1.9 in length of second; fifth dorsal spine longest, its length equal to distance from tip of snout to pupil; last dorsal ray produced, its length about 1.8 times that of the preceding; anal similar to soft dorsal, its origin under base of third dorsal ray; first anal spine very short, the third longest, its length 1.2 in diameter of eye; soft anal similar to soft dorsal, the last ray produced and of equal length with that of dorsal; caudal densely scaled and widely forked, lobes equal, their length, measured from base of first supporting rays equaling that of head; ventrals not pointed, their tips not reaching vent, their length 1.6 in head; pectoral long, slightly falcate, its tip reaching vent and much beyond that of ventral, its length equaling that of head; scales rather small, closely imbricated, deeper than long, their edges finely ciliated; cheek and opercles scaled, 6 rows on cheek; a large bony humeral scale from which extends a series of modified scales to nape, and in front of which is a patch of ordinary scales; lateral line complete and well developed, beginning at lower edge of humeral scale and following contour of back to base of middle caudal rays, the tubes little branched.

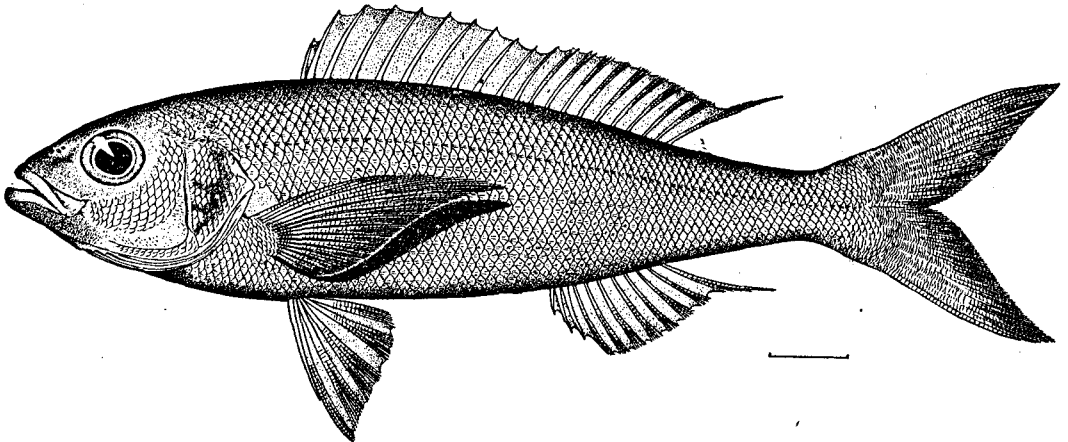


FIG. 98.—*Bowersia ulaula* Jordan & Evermann; from the type.

Color in alcohol, brownish or purplish olivaceous above, paler on side; under parts nearly plain white; each scale of back and upper part of side with a darker brown spot, these forming indistinct rows, about 6 above lateral line; side below lateral line with less distinct horizontal lines; upper parts of head olivaceous brown, lower parts paler, spines of dorsal fin purplish, the membranes white, purplish at tips; soft dorsal with rays whitish, membranes purplish; caudal slightly dusky, other fins plain whitish.

This species is related to *B. violescens*, from which it differs chiefly in the shorter snout, larger eye, shorter maxillary, shorter mandible, narrower interorbital space, decidedly smaller scales, more numerous gillrakers, and more posterior insertion of dorsal fin. Only one specimen known, type No. 50661, U. S. N. M. (field No. 04104), 14.25 inches long, from Hilo, Hawaii Island.

Bowersia ulaula Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 183, Hilo.

Genus 133. APRION Cuvier & Valenciennes.

Body oblong or elongate, compressed; scales large; mouth rather small; villiform teeth on vomer, palatines and jaws, outer series on jaws somewhat enlarged and canine-like; no teeth on tongue; preopercle entire; interorbital flat; last ray of dorsal and anal somewhat produced; dorsal

continuous, not notched; skull essentially as in *Etelis*, the flat interorbital area separated from the occipital by a transverse line of demarcation by which the median as well as the lateral crests are limited; frontals wide in front, and not cavernous; supraorbital margin crenate; periotic region much swollen outward and with the bones thin and polished; frontals behind with funnel-shaped foramina; preorbital moderate.

Aprion has essentially the form of *Lutianus* with the skull of *Etelis*. The single American species (*A. macrophthalmus*) belongs to the subgenus *Chatopterus*, which agrees with *A. virescens* in the form of the skull, differing chiefly in the specific characters of deeper body, weaker teeth, and narrower preorbital. Species few; only one known from the Hawaiian Islands.

Aprion Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 543, 1830 (*virescens*).

Chatopterus Terminck & Schlegel, Fauna Japonica, Poiss., 78, 1844 (*dubius*).

Pristipomoides Bleeker, Nat. Tijds. Ned. Ind., III, 1852, 574 (*typus*).

Platygnathus Gill, Proc. Ac. Nat. Sci. Phila. 1862, 237 (*vorax*=*macrophthalmus*).

Sparopsis Kner, Fische Mus. Godeffroy, 302, 1868 (*elongatus*).

183. *Aprion virescens* Cuvier & Valenciennes. "Uku." Fig. 99.

Head 3.2 in length; depth 4.1; eye 5.4 in head; snout 2.2; maxillary 2.45; mandible 2; preorbital 4.8; interorbital 3; Br. 7; D. x, 11; A. 11 or 13, 8; scales 8-49-13.

Body long, slender, and moderately compressed, the dorsal and ventral outlines gently curved; head large, much larger than deep; snout long and bluntly conic; mouth large, somewhat oblique, the maxillary reaching orbit, slipping for its entire length under the broad preorbital, its width at tip about 1.75 in eye; jaws co-terminous, the lower projecting somewhat in the young; eye rather high up, considerably above the axis of the body; interorbital space broad and flat; opercle ending in one

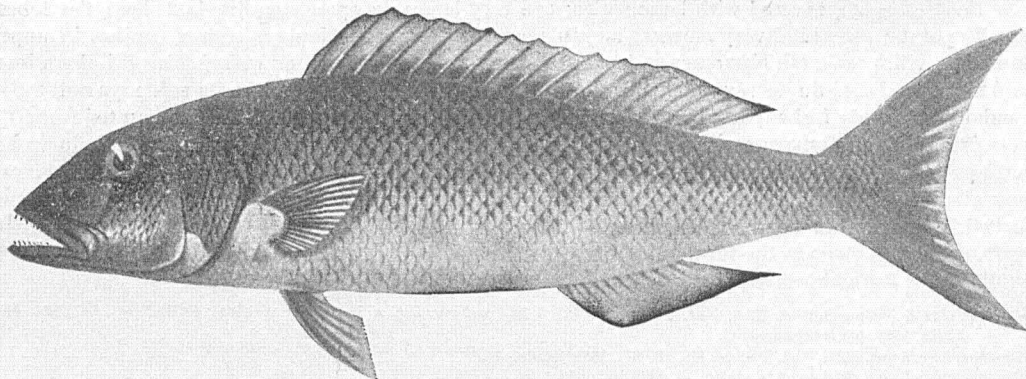


FIG. 99.—*Aprion virescens* Cuvier & Valenciennes; after Bleeker.

broad, flat, obscure spine; preopercle smooth; caudal peduncle long, its length slightly greater than that of snout, its least width about 1.75 in its least depth, which is 4 in head; dorsal fin continuous, not greatly notched, its origin behind base of pectoral, and midway between tip of snout and base of third dorsal ray; distance from origin of dorsal to base of first supporting caudal rays twice length of head; first dorsal ray short and slender, its length not exceeding diameter of pupil, fourth or fifth dorsal ray longest, about 3 in head, last dorsal ray produced, about one-third longer than preceding; first anal spine small, obscure, or entirely absent in large examples; third anal spine weak, its length less than diameter of eye; soft portion of anal similar to that of dorsal; caudal widely forked, the lower lobe sometimes the longer, its length a little shorter than that of head; ventrals short, reaching scarcely half way to origin of anal, 1.9 in head; pectoral very short and broad, the length about 2.75 in head; scales loose, large, somewhat deeper than long; lateral line fully developed and concurrent with the back; cheek and opercles scaled, 5 rows on cheek; anal and soft dorsal naked; caudal scaled.

Color in life (No. 03411), uniform light gray, the upper parts tinged with blue, which, on top of head to snout and about eye, becomes distinct dark blue, without distinct outline, gradually disappearing toward lower parts; lower parts much lighter, becoming almost white on ventral line; 3

indistinct dusky spots on membranes of dorsal between seventh and tenth spines (one between each two); no other distinct markings on dorsal, but a tinge of yellow over the whole; ventral rays white, membranes yellow; anal whitish; caudal unmarked.

Color in alcohol of some specimens, dusky-bluish above and on sides, whitish below; head with some purplish; spinous dorsal with the membrane dusky at tips, 3 black spots on membranes between seventh and tenth spines; soft dorsal, caudal and anal dusky, ventrals white, dusky at tips; pectoral dusky.

This fish is common about Honolulu, being brought into the market almost every day. It is one of the best of food-fishes. The above description, based chiefly upon (No. 03411) a specimen 2 feet long, obtained in the Honolulu market. We have 17 excellent specimens from Honolulu, Hilo, and Kailua, and others were obtained at Honolulu by Dr. Jenkins and the *Albatross*. This species is known not only from the Hawaiian Islands, but also from the Society Islands, Macassar, Celebes, Ternate, and Amboyna. Length 7 to 24 inches.

Aprion vivescens Cuvier & Valenciennes, *Hist. Nat. Poiss.*, VI, 644, pl. 168, 1830, *Seychelles*; Günther, *Fische der Südsee*, I, 16, 1873 (Society and Hawaiian Islands); Steindachner, *Denks. Ak. Wiss. Wien*, LXX, 1900, 484 (Honolulu); Jenkins, *Bull. U. S. Fish Comm.*, XXII, 1902 (Sept. 23, 1903), 452 (Honolulu); Snyder, *op. cit.* (Jan. 19, 1904), 527 (Honolulu).

Mesoprion microchir Bleeker, *Nat. Tijds. Ned. Ind.*, V, 1853, 332, *Amboyna*.

Lufjanus microchir, Bleeker, *Nat. Tijds. Dierk.*, I, 1863, 233.

Sparopsis elongatus Kner, *Sitzb. Ak. Wiss. Wien*, LVIII, Part I, 1868, 303, pl. 3, fig. 6, *Fiji Islands*.

Chaetopterus microchir, Bleeker, *Varst. Kon. Ak. Wet.*, III, 1869, 85 (Ternate and Amboyna).

Aprion (Aprion) vivescens, Bleeker, *Atlas*, VII, 77, pl. 238, fig. 3, 1876 (Macassar, Celebes, Ternate, Amboyna).

Genus 134. *ETELIS* Cuvier & Valenciennes.

Body elongate, covered with large scales; eye very large; preopercle ending in 2 short, flat lobes, hardly points; preorbital very narrow; mouth moderate, the lower jaw projecting; canines in upper jaw only, villiform teeth on vomer and palatines; no teeth on tongue or pterygoids; gillrakers long and slender; dorsal fin deeply notched, rather short, its spines 10 in number, its soft rays not scaly; caudal very deeply forked; head naked above, skull with the interorbital area flat, separated from the occipital area by a transverse line, limiting the median and lateral crests also; frontals wide in front, not cavernous, simply normally perforate; supraorbital margins crenate; periotic region little convex, and with the bones thick, unpolished; prefrontals behind, with funnel-shaped foramina; caudal deeply forked; dorsal spines 10, the last shortest, the membrane falling far short of the ray following. In spite of the difference in the form of its dorsal, the relations of *Etelis* with *Aprion* are very close. The skulls in the 2 are almost identical, as has already been noticed by Poey and Gill.

Etelis Cuvier & Valenciennes, *Hist. Nat. Poiss.*, II, 127, 1+2^s (*carbunculus*, a Japanese species); Gill, *Proc. Ac. Nat. Sci. Phila.* 1862, 447 (*carbunculus*).

Elastoma Swainson, *Nat. Hist. Fishes*, II, 168, 202, 1839 (*oculatus*).

Hesperanthias Lowe, *Fishes of Madeira*, 14, 1843 (*oculatus*).

Macrops Dumeril, *Ichthyologie Analytique*, 279, 1856 (*oculatus*).

- a. Eye small, 4 in head; caudal lobes not much produced, about equal in length, not longer than head; gillrakers 3 + 9.....*marshi*, p. 240
 aa. Eye comparatively large, 3 in head; caudal lobes much produced, the upper longer than head; gillrakers 6 + 15.....*curvus*, p. 242

134. *Etelis marshi* (Jenkins). "*Ulaula*." Plate XVII and Fig. 100.

Head 3 in length; depth 3.5; eye 4 in head; snout 3.4; preorbital 7; maxillary 2; mandible 1.8; interorbital 3.9; D. x, 11; A. III, 8; scales 6-51-11; Br. 7; gillrakers 3+9.

Body rather long, tapering, moderately compressed; the dorsal and ventral outlines gently convex; head rather large, bluntly pointed; snout bluntly pointed, slightly greater than eye; jaws subequal, the lower slightly projecting, its tip entering into the anterior rounded profile; maxillary long, reaching past middle of orbit, its width at tip equal to vertical diameter of pupil; mouth rather large, somewhat oblique; teeth on jaws, vomer, and palatines, those on jaws in villiform bands; an outer series of enlarged, sparse-set canines in each jaw, the one in front on each side longest, those of upper jaw somewhat stronger than those in the lower; tongue without teeth; eye large, its horizontal diameter slightly the greater; interorbital space flat, with a broad median groove, the ridges on each side some-

what roughened; preorbital thin, its edge smooth; opercle ending in 2 broad flat spines; preopercle finely dentate, teeth strongest at the angle, but no spines especially enlarged; gillrakers few, moderate in length, the longest about 3 in eye, the number about 3+9; fins moderately developed; dorsal fin deeply notched, almost divided into 2 fins; origin of spinous dorsal posterior to base of pectoral, its distance from tip of snout equal to distance to base of fifth dorsal ray; first dorsal spine short, about equal to diameter of pupil, third and fourth dorsal spines longest, about 2.4 in head, ninth dorsal spine short, about 2 in second; dorsal rays subequal, the last about 1.25 in third dorsal spine; origin of anal under about fourth dorsal ray; first anal spine very short, third longest, about 1.75 in third dorsal spine; last anal ray about equal to last one of dorsal; caudal rather widely forked, the lobes about equal, their length equal to distance from tip of snout to edge of preopercle, their outer rays not especially produced; ventrals rather short, reaching but slightly more than half distance to origin of anal, their length about 2 in head; pectoral longer, the upper rays somewhat produced, the fin slightly falcate, the length 1.2 in head; scales moderately large, firm, deeper than long; cheek and opercle scaled, the former with 6 rows; a large modified humeral scale; lateral line beginning at humeral scale and following contour of back, ceasing at base of caudal.

Color in life, rose-red, not quite so brilliant as in *Etelis curvus*; a golden stripe along lateral line, mouth not red inside; axil deep red; belly silvery, but less abruptly so than in *E. curvus* and somewhat shaded with rose; fins rose-colored, the first dorsal and caudal brightest, ventrals and anal almost

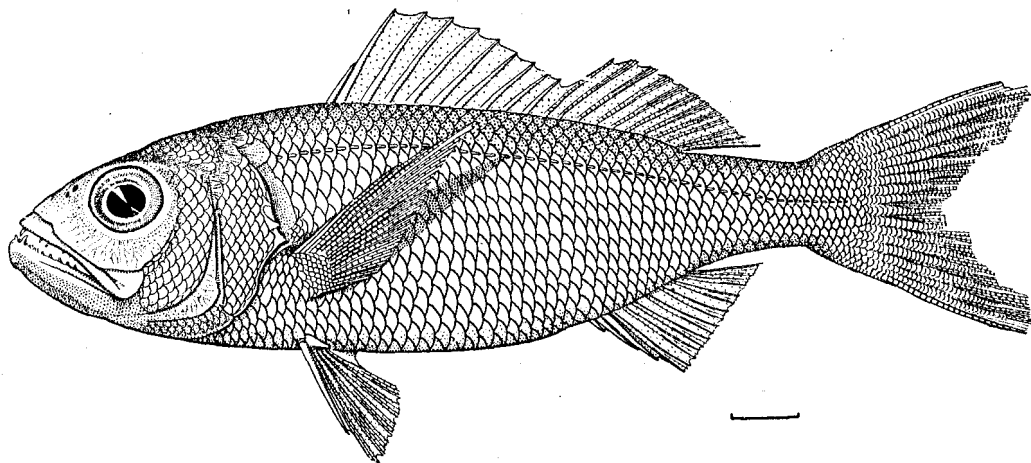


FIG. 100.—*Etelis marshi* (Jenkins). Type of *Eteliscus marshi* Jenkins.

white; a faint whitish stripe along side below golden one. Another specimen (No. 03378), 2 feet long, from Honolulu, nearly fresh, was very bright red, silvery below, the center of each scale on back golden, these forming streaks; lateral line golden; upper fins bright red; lower fins pale red.

Color in spirits, light dusky, yellowish above, paler on the sides, whitish below; top of head dusky yellowish; fins all uniform whitish.

The above description based chiefly upon a specimen (No. 04148) 16.75 inches long, from Hilo.

This species reaches a length of at least 2 feet, and is a common and important food-fish both at Honolulu and Hilo. The spawning time seems to be in the middle of the summer, several of the examples obtained by us in July being full of ripe spawn. It is close to *E. curvus* from which it differs, however, in the smaller eye, much stronger teeth, somewhat shorter body, and in not having the caudal lobes markedly produced. It is rather common in deep water, especially off Hilo. The type (No. 50714, U. S. N. M.) was obtained by Dr. Wood at Honolulu. Our collection contains 4 specimens from Honolulu, 9 from Hilo, and 1 from Kailua, ranging from 10 to 26 inches long.

Eteliscus marshi Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 452, fig. 21, Honolulu.

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185. *Etelis evurus* Jordan & Evermann. "*Ulaula*." Plates XVIII and 38.

Head 3.2 in length; depth 3.6; eye 3 in head; snout 3.9; maxillary 2.2; interorbital 3.6; D. x, 11; A. iii, 8; scales 5-50-11; Br. 6; gillrakers 15 + 6, longest about 2 in eye.

Body rather long, tapering, moderately compressed; dorsal outline slightly convex, ventral outline nearly straight; head considerably longer than deep, compressed, subconic, snout bluntly pointed, less than eye, equal to portion of eye anterior to posterior edge of pupil; mouth large, oblique; small bands of villiform teeth on vomer, palatines, and anterior part of each jaw; a single row of small wide-set, slender canine teeth on the outer edge of each jaw, those in upper jaw slightly larger and more wide-set; a single larger canine tooth on the side of each jaw in front, those in the upper jaw the larger; maxillary extending to middle of pupil; eye very large, its lower edge slightly below axis of body; preopercle finely serrate; opercle with 2 broad, flat spines, not produced, the upper rather obscure; fins moderately developed; origin of spinous dorsal slightly posterior to base of pectoral, its distance from tip of snout equaling that to base of sixth dorsal ray; dorsal fin deeply notched, almost divided; first dorsal spine short, its length but slightly greater than diameter of pupil; third dorsal spine longest, 2.1 in head; ninth spine short, its length 2.75 in third; soft dorsal not elevated, the rays about equal, the last 1.75 in third spine; anal similar to soft dorsal, the first spine very short, the third about 1.8 in third dorsal spine, last anal ray about equal to last dorsal ray; caudal deeply notched, the lobes much produced, the upper the longer, its rays greatly exceeding length of head, or about 2.4 in body; ventrals long, but not reaching vent by a distance equaling half diameter of pupil, their length 1.5 in head; pectoral long, reaching vent, the upper rays somewhat produced, their length 1.2 in head; scales moderate, firm, covering body, nape, opercles, and breast; a large humeral scale; lateral line beginning at lower edge of humeral scale and following contour of back to base of caudal fin.

Color in life, of a specimen (field No. 03481) 14 inches long, brilliant rose-red, the side from level of eye abruptly silver, with rosy shades; snout, jaws, eye, and inside of mouth red; fins all rose-color, the dorsal and caudal bright; ventrals and anal pale, the former washed with red on center; axil pale pink; pectoral pale rosy.

Color in alcohol, uniform yellowish white, paler below; fins all pale yellowish white, the caudal lobes somewhat dark.

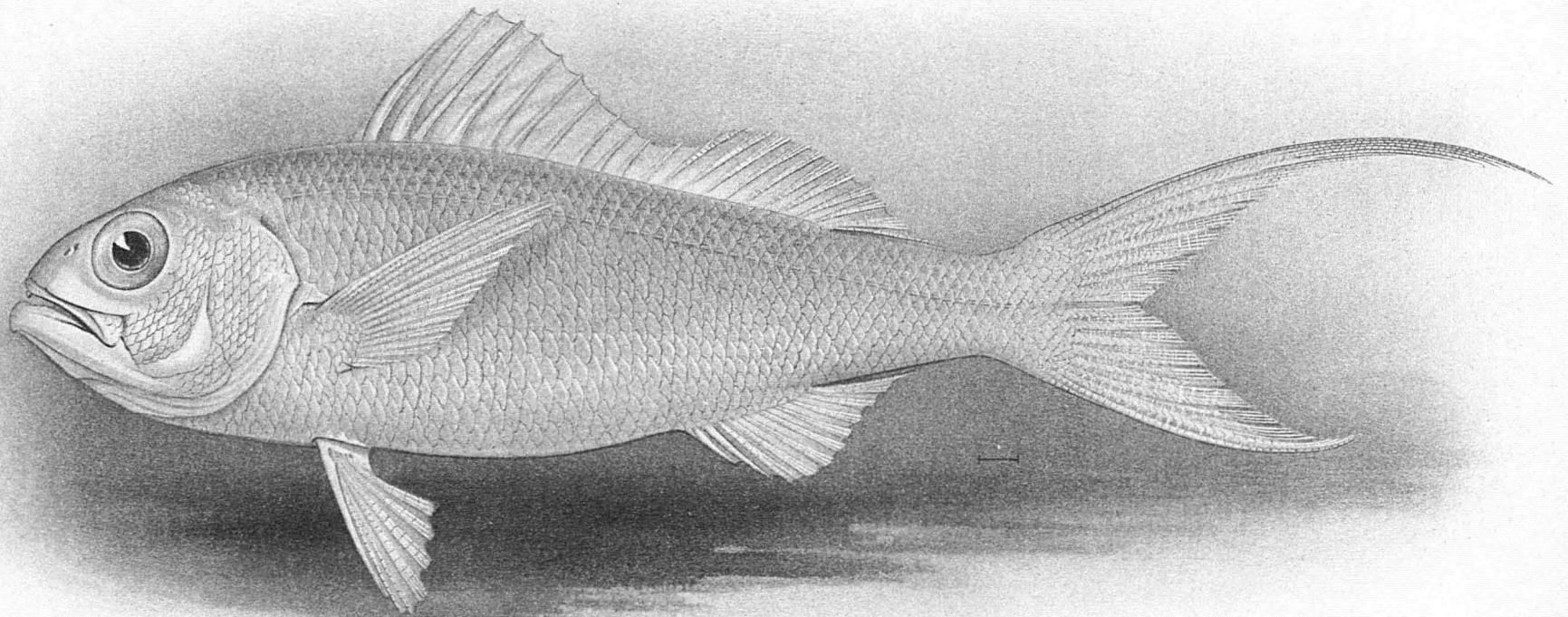
This species is related to *Etelis oculatus* of the West Indies, from which it differs in the somewhat larger scales, much longer caudal lobes (9.5 times length of middle rays instead of 4 times, as in *E. oculatus*), and larger eye. From *E. carbunculus* Cuvier & Valenciennes, from Isle of France, it seems to differ in the coloration, and in having only 16 instead of 20 scales in a transverse series. It is one of the handsomest of all Hawaiian fishes, thus far known only from Hilo, Hawaii, in the market of which we obtained 13 fine examples, and from Honolulu, where it was obtained by the *Albatross*.

Length 11 to 16.5 inches.

Etelis evurus Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (April 11, 1903), 184, Hilo; Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Family LXIII. SPARIDÆ.—The Porgies.

Body oblong or more or less elevated, covered with rather large, adherent scales, which are never truly ctenoid; lateral line well developed, concurrent with the back, not extending on caudal fin; head large, the crests on the skull usually largely developed; no suborbital stay; mouth small, terminal, low, and horizontal; premaxillaries little protractile; maxillary short, peculiar in form and in articulation, without supplemental bone, for most of its length slipping under the edge of the preorbital, which forms a more or less distinct sheath; preorbital usually broad; teeth strong, those in front of jaws conical, incisor-like or molar; lateral teeth of jaws always blunt and molar; no teeth on vomer or palatines; posterior nostril largest, usually more or less oblong or slit-like; lower pharyngeals separate; gills 4, a large slit behind the fourth; pseudobranchiæ large; gillrakers moderate; gill-membranes separate, free from the isthmus; preopercle entire or serrulate; opercle without spines; sides of head usually scaly; dorsal fin single, continuous, or deeply notched, the spines usually strong, depressible in a groove; spines heteracanthous, that is, alternating, the one stronger on the right side, the other on the left, the spines 10 to 13 in number; anal fin rather short, similar to the soft dorsal, and with 3 spines; ventral fins thoracic, the rays 1, 5, with a more or less distinct scale-like appendage



ETELIS EVURUS JORDAN & EVERMANN. TYPE.

at base; caudal fin usually more or less concave behind; air-bladder present, usually simple; pyloric caeca few; vertebrae usually $10 + 14 = 24$; intestinal canal short.

Carnivorous shore-fishes of the tropical seas, especially abundant in the Mediterranean, Red Sea, and West Indies. Genera about 12, species about 90, most of them much valued as food.

Only one species thus far known from the Hawaiian Islands.

Genus 135. MONOTAXIS Bennett.

Jaws each with several conical, canine-like teeth in front, and with a single series of molars on the sides; cheek scaly; dorsal fin with 10 spines, depressible in a groove; anal spines 3; scales moderate; branchiostegals 6; pyloric appendages few. Species few.

Monotaxis Bennett, *Life of Raffles*, 688, 1830 (*indica*).

Sphaerodon Rüppell, *Neue Wirbelthiere, Fische*, 112, 1838 (*grandoculis*).

186. *Monotaxis grandoculis* (Forskål). "Mu," "Mamamu." Fig. 101.

Head 3.1 in length; depth 2.5; eye 4 in head; snout 2.2; preorbital 3.1; interorbital 2.75; D. x, 11; A. III, 10; scales 6-46-12.

Body oblong, deep, compressed, back not much elevated; profile from nape to tip of snout nearly straight, being steeper from the prominence in front of eye to tip of snout; head slightly deeper than

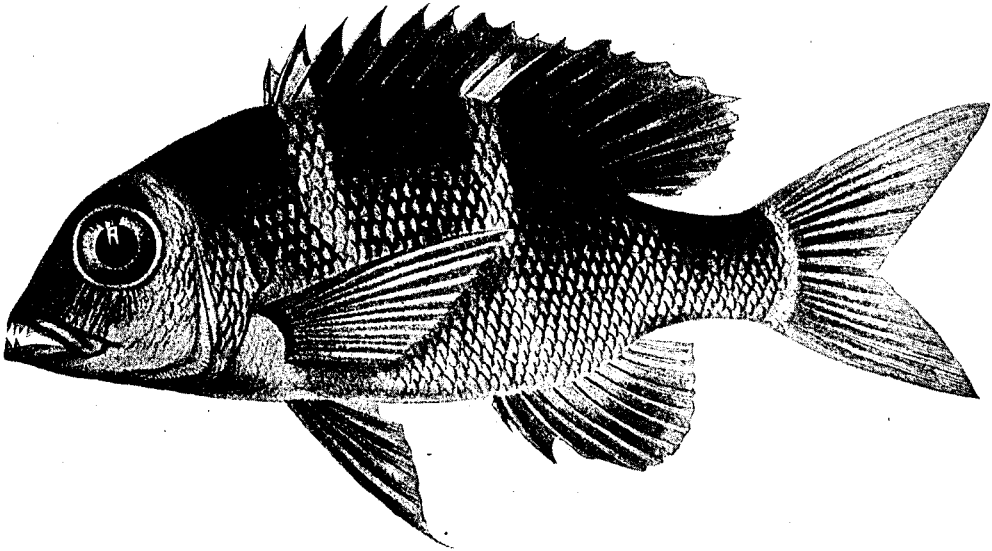


FIG. 101.—*Monotaxis grandoculis* (Forskål); after Bleeker.

long, compressed; snout bluntly rounded; mouth large, horizontal; jaws equal, maxillary entirely concealed except for its lower edge; teeth large, wide, and irregularly set, conic teeth in anterior part of each jaw, lateral teeth on each jaw large and molar; preorbital very broad; preopercle entire; eye anterior, high, upper edge of pupil on line with lateral line; dorsal fin continuous, its origin slightly in advance of pectoral, its distance from tip of snout equal to its distance from base of ventrals, longest spine 2.1 in head, first spine short and weak, .6 height of second; soft dorsal rounded, rays much longer than spines, longest 1.75 in head; anal similar to soft dorsal, longest spine 2.5 in head, ray 1.75; caudal broad and strong, rather deeply forked, its lobes short and strong; pectoral broadly falcate, its tip reaching as far as those of ventrals, nearly 1 in head; ventrals falcate, reaching past vent, nearly to base of anal, 1.2 in head; scales rather large, much deeper than long, cycloid; top of head, snout, mandible and cheek naked; 3 rows of large scales on upper and 6 on lower part of preopercle, 6 rows on opercle; soft dorsal and anal moderately sheathed; a single row of small scales on each caudal ray, extending nearly to tip; lateral line concurrent with dorsal outline.

Color in life, scales below lateral line pale silvery with a purplish tinge; margin of scales on middle of body and on the upper part of opercle greenish yellow, those on back darker, with margin blackish yellow; belly pale, margin of scales on belly darkish; a blackish band on nape; head and snout purplish gray; cheek with a dark dirty purplish blotch tinged with yellow; lips darkish yellow; inside of mouth reddish, spinous dorsal pale purplish silvery, margin of the membranes with a wide deep cardinal stripe; soft dorsal blackish claret, rays paler; caudal dirty claret, somewhat paler than soft dorsal, rays paler, margin reddish; anal same as soft dorsal, spines dark reddish, black blotches at root of third to sixth membrane inclusive; pectoral pale reddish, axil black; ventrals very pale purplish, tips darkish; iris silvery-yellow, the upper border blackish silvery, this border with a deep cardinal border ventrally; root of pseudobranchie purple.

A smaller example (No. 03241), 9 inches long, from Honolulu, showed the following colors in life: Olive-gray, silvery below, each scale above with a bluish white center; traces of 4 narrow, whitish, yellowish cross-bars on back; one at nape, one under first dorsal spines, one under last dorsal spines, and one under last dorsal rays; head paler and more yellowish; a black spot on upper part of eye; inside of jaws bright red; spinous dorsal dirty gray, the pale band of back extending on it; soft dorsal with a large black central blotch, the last rays reddish white; caudal reddish gray, the rays mostly grayish, the membranes deep red; anal gray, blackish mesially, the rays tipped with dirty red; ventrals whitish, tipped with dirty red; pectoral light rusty red, the color fading on lower rays; a small black axillary spot with yellowish shade below it. Smaller examples show yellowish on fins and head rather than red; a dusky bar on cheek below eye; pale bars more distinct, the interspaces more clearly black.

Color in alcohol, grayish brown above, lighter below, margin of scales darker; top of head and cheek darker brown; a black blotch on upper edge of the yellow iris; spinous dorsal pale brown with a darker blotch on the anterior part of each membrane; membrane of soft dorsal, anal, and caudal dark; pectoral pale, black at axis; ventrals pale, tipped with dark brownish.

The above description based chiefly upon (No. 04140), a specimen 20.5 inches long from Hoopuloa, Hawaii.

Our collection contains 22 specimens 5 to 20 inches long, the localities represented being Honolulu, and Kailua and Hoopuloa, Hawaii.

This fish reaches a length of about 22 inches. It is fairly abundant and highly prized as a food-fish, always commanding a high price. It has a very wide distribution among the Pacific islands.

Sciæna grandoculis Forskål, Descript. Animal., 53, 1775, Djidda.

Lethrinus latidens Cuvier & Valenciennes, Hist. Nat. Poiss., VI, 316, 1830, New Guinea.

Monotaxis indica Bennett, Life of Raffles, Cat. Fish. Sumatra, 683, 1830, Sumatra.

Pagrus heterodon Bleeker, Bijdr. Ichth. Halmahera, Nat. Ned. Ind., VI, 51, 1854, Sindangole.

Sphaerodon latidens, Kner, Novara, 83, pl. 4, fig. 1, 1865 (Australia).

Sphaerodon grandoculis, Günther, Fische der Südsee, II, 67, 1874 (Sandwich Islands).

Monotaxis grandoculis, Bleeker, Atlas, VIII, 105, pl. 299, fig. 1, 1876 (Sumatra, Batu, Celebes, Halmahera, Obimajor, Amboyna).

Sphaerodon heterodon, Bleeker, Atlas, VIII, pl. 299, 1876 (name on plate).

Sparisomus unicolor, Fowler, Proc. Ac. Nat. Sci. Phila. 1900, 502 (Honolulu); not of Quoy & Gaimard.

Monotaxis grandoculis, Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 453 (Honolulu); Snyder, op. cit. (Jan. 19, 1904), 527 (Honolulu).

Family LXIV. MÆNIDÆ.—The Picarels.

Body oblong or elongate, covered with moderate or small ciliated scales; mouth moderate or small, extremely protractile, the spines of the premaxillaries extending backward to the occiput; teeth small or wanting, all pointed; no incisors or molars; dorsal continuous or divided, the spines very slender; preopercle entire; intestine short, with few pyloric cæca. Carnivorous shore-fishes, chiefly of the Old World. In the form of the mouth they present analogies to the *Gerridae*, in other regards they closely resemble the *Hæmulida*. Genera 4 or 5; species about 25.

Genus 136. ERYTHRICHTHYS Temminck & Schlegel.

Body elongate; caudal peduncle long; snout rather sharply conic; mouth very protractile, the processes of the intermaxillaries extending to occiput; dorsal fins 2, scarcely, if at all, connected, the spines all slender and feeble; no detached dorsal spines; caudal widely forked, the lobes long and

pointed; no teeth on jaws, vomer or palatines; lower pharyngeals separated from each other, and like the upper ones, armed with cardiform teeth; preopercle entire; scales rather small, ciliated; branchiostegals, 7; pseudobranchiae present.

This genus is distinct from *Emmelichthys*, differing chiefly in having no detached dorsal spines.

Erythrichthys Temminck & Schlegel, Fauna Japonica, Poiss., 117, 1845 (*schlegelii*).

187. *Erythrichthys schlegelii* Günther. Plate XIX and Fig. 102.

Head 3.4 in length; depth 4; eye 3.4 in head; snout 3.6; maxillary 2; mandible 2; preorbital 7; interorbital 3.75; D. x-i, 11; A. III, 10; scales 10-75-17; Br. 7; gillrakers 24+6, the longest about 2 in eye.

Body long and slender, deepest at vertical of pectoral, thence gradually tapering to the long caudal peduncle, not much compressed, the back not much elevated; head moderate, conic; snout rather sharply conic; mouth rather large, somewhat oblique, the maxillary reaching anterior edge of pupil; vomer, palatines, tongue, and jaws toothless, the latter sometimes with a few very small villous teeth; premaxillaries greatly protractile; lower jaw projecting, its tip rounded, entering into dorsal profile; eye very large; its center scarcely above axis of body; interorbital broad and convex; preorbital very narrow; opercle smooth, 2 weak flat spines on its upper portion, the bony portion between these deeply emarginate; preopercle slightly crenate or fluted, not serrate, the angle rather broadly rounded; origin of spinous dorsal slightly posterior to base of ventrals, a little nearer tip of snout than base of last dorsal ray; dorsal spines all slender, the first short, about 2.5 in second; third longest, about 2 in head, the

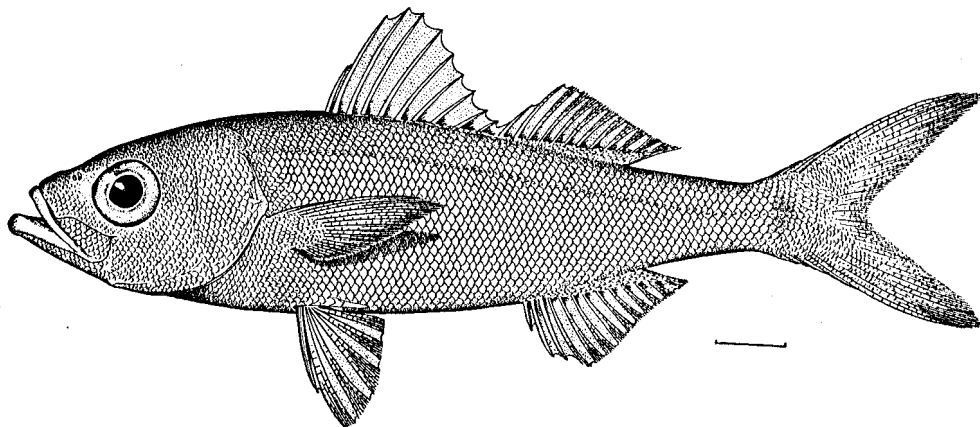


FIG. 102.—*Erythrichthys schlegelii* Günther.

tenth shortest, rather remote from the ninth but connected with it by a membrane, scarcely or not at all connected with the eleventh, which is somewhat longer, 1.6 in eye; soft dorsal with a scaly-sheathed base, the rays approximately equal, 1.1 in eye; anal similar to soft dorsal, the first spine short, about 2.5 in second, the third longest, about equal to eye, second anal ray slightly longer; caudal widely forked, lobes equal, long and pointed, about equaling head; ventrals short, reaching about two-fifths distance to vent, their length a little shorter than snout and eye; pectoral short, not reaching tips of ventrals, the length 1.6 in head; scales small, very finely ctenoid, deeper than long, firm, covering base of caudal and forming a scaly sheath at base of anal and dorsal fins; head completely scaled, 6 rows of scales on maxillary; mandibles scaled.

Color in life of an example (No. 03491) from Hilo, pinkish olive, pinkish silvery below; back with golden luster; faint yellowish cross-bands spreading from lateral line, these being muscle marks; faint darker streaks above middle of side; head orange-red, yellowish on side, red below; jaws red; sheath of scales of dorsal salmon-color; dorsal translucent, the spinous part orange-tinted, the rest light crimson; lower fins red; pupil orange within, silvery without; middle of side distinctly yellowish, the general effect orange.

Color in alcohol, pale yellowish orange, deepest above and on head; under parts whitish; faint brownish or orange streaks along the rows of scales; fins all whitish, tinged with orange.

This species reaches a length of something more than a foot. It does not appear to be very common, as our collection contains only 5 specimens, all from deep water off Hilo. It was described originally from Japan.

Erythrichthys sp? Schlegel, Fauna Japonica, Poiss., VII-IX, 117, pl. 63, fig. 1, 1845, Japan.

Erythrichthys schlegelii Günther, Cat., I, 395, 1859, Japanese Seas.

Emmetichthys schlegelii, Bleeker, Enumr. Poiss., Japan, Nat. Verh. Kon. Ak., XVIII, 8, 1879 (name only).

Family LXV. KYPHOSIDÆ.—The Rudder Fishes.

Herbivorous fishes with incisor teeth only in the front of the jaws; body oblong or elevated, with moderate or small scales, ctenoid or not; mouth moderate, with incisor-like teeth in the front of each jaw; no molars; teeth on vomer and palatines present or absent; premaxillaries moderately protractile; preorbital rather narrow, sheathing the maxillary; gillrakers moderate; pseudobranchiæ well developed; opercles entire; gills 4, a slit behind the fourth; gill-membranes separate, free from the isthmus; dorsal fin continuous or divided, with 10 to 15 rather strong spines, the soft dorsal naked or scaly; anal with 3 spines; ventrals thoracic, the rays 1, 5, an accessory scale at base; caudal lunate or forked; pectoral fin with all its rays branched; intestinal canal elongate, with a few or many pyloric cæca; air-bladder usually with 2 posterior horns; vertebrae in ordinary or slightly increased number, 24 to 28; post-temporal of normal percoid form, the stout forks not adnate to the cranium. Herbivorous shore fishes, feeding largely on green or olive algae; chiefly of the Mediterranean Sea and the Pacific Ocean; most of them valued as food. Genera 20, species about 70.

- a. Incisor teeth well developed, each with a conspicuous horizontal process or root; caudal fin moderate, about as long as head, the outer rays not 3 times as long as middle rays; junction of gill-membranes forming an angle *Kyphosus*, p. 246
 aa. Incisor teeth small, with conspicuous roots; caudal much longer than head, the lobes falcate, the outer 5 times length of middle rays; gill-membranes not forming an angle at junction..... *Sectator*, p. 248

Genus 137. KYPHOSUS Lacépède. The Chopas.

Body elongate-ovate, regularly elliptical, moderately compressed; head short, with blunt snout; eye large; mouth small, horizontal; maxillary barely reaching front of eye; each jaw with a single series of rather narrow obtusely lanceolate incisors, implanted with compressed conspicuous roots posteriorly; behind these a narrow band of villiform teeth; fine teeth on vomer, palatines, and tongue; branchiostegals, 7; gillrakers long; preopercle obsoletely serrate; preorbital narrow, covering but little of the maxillary; squamation very complete, the space between and about the eyes being the only naked part; scales smallish, thick, ctenoid, 60 to 70 in the lateral line, which is continuous; similar scales entirely covering the soft parts of the vertical fins, and extending up on the paired fins; dorsal fin low, with about 11 spines, which are depressible in a groove of scales, the fin continuous but the last spines low, so that a depression occurs between the 2 parts of the fin, the bases of the spinous and soft parts about equal; soft dorsal rather low in front, not falcate, pointed behind; pectoral fins small, ventrals well behind them; intestinal canal long; pyloric cæca very numerous; vertebrae 9 or 10+15 or 16=25. This genus contains some 10 species, chiefly confined to the Pacific Ocean, and most of them valued as food; 2 species found in the West Indies. Two species known from the Hawaiian Islands.

Kyphosus Lacépède, Hist. Nat. Poiss., III, 114, 1802 (*bigibbus*=*fuscus*).

Pimelepterus Lacépède, op. cit., IV, 429, 1802 (*bosquí*=*sclatrica*).

Dorsuarius Lacépède, op. cit., V, 482, 1803 (*nigrescens*=*fuscus*).

Xyster Lacépède, op. cit., V, 484, 1803 (*fuscus*).

Salcina Bowditch, Excursion Madeira, 238, fig. 37, 1825 (*aurata*).

? *Opisthistius* Gill, Proc. Ac. Nat. Sci. Phila. 1862, 245 (*tahnel*).

- a. Caudal peduncle short, 2.5 in head; body deep, the depth 2.15 in length; scales 10-72-17..... *sandwicensis*, p. 247
 aa. Caudal peduncle longer, 1.5 in head; body more slender, the depth 2.4 in length; scales 12-82-21..... *fuscus*, p. 248

188. *Kyphosus sandwicensis* (Sauvage). "*Nemue paitii*."

Head 3.75 in length; depth 2.15; eye 4.3 in head; snout 2.9; maxillary 3.25; interorbital 2.3; D. XI, 12; A. III, 11; scales 10-72-17.

Body elongate-ovate, regularly elliptical, moderately compressed; dorsal outline evenly curved, nearly uniform from origin of dorsal to tip of snout, a slight depression over eyes, thence steeper to tip of snout; head deeper than long, compressed; snout bluntly rounded; jaws equal, the upper lip very broad, maxillary slipping under preorbital for most of its length, not quite reaching eye; a single row of moderately broad and strong incisor teeth on each jaw, their roots with very conspicuous backward parallel prolongation; behind these a narrow band of villiform teeth, similar villiform teeth on vomer and palatines; tongue very inconspicuous; eye entirely above axis of pectoral, anterior, with a prominence on snout above and in front of it; preorbital entire; interorbital broad and convex; caudal peduncle short, its length 2.5 in head; origin of dorsal slightly behind origin of ventrals; distance from origin of dorsal to tip of snout slightly less than depth; dorsal spines moderately strong, longest spine much higher than soft dorsal, 1.9 in head; first spine half as long as second; caudal broad, not deeply forked, its upper lobes slightly the longer, the length, measured from base of first supporting ray to tip, slightly longer than head; anal similar to soft dorsal, its base equal to that of soft dorsal, each about 1.2 in head; pectoral broadly falcate, 1.5 in head, not reaching nearly as far as ventrals; ventrals resembling pectoral, slightly longer, 1.35 in head; scales moderate, ctenoid, larger on the sides of body, deeper than long, entire body and head scaled, except snout from upper front of eye to tip, scales on head small, small scales on entire soft dorsal, anal, and caudal, and most of pectoral and ventrals; lateral line concurrent with dorsal outline.

Color in life (No. 05044, paper tag 3510), 23 inches long, body above lateral line silvery blue, with 5 or 6 greenish-yellow stripes which diffuse at the region of nape imparting to the back a greenish reflection; below the lateral line 10 greenish-yellow stripes along the intersection of scales on pale silvery-blue ground; margin of scales blackish; belly pale silvery blue; throat slightly reddish; head and top of nape dark-bluish emerald green, margin of scales blackish; a blue bar across occiput; snout blackish blue; cheek pale silvery blue; a golden-brown bar from angle of mouth toward angle of preopercle, another but wider bar of same color posteriorly from eye; anterior edge of opercle golden brown, a greenish-brown blotch on upper corner, a dark blotch on middle, posterior edge dark, dirty golden brown; anterior edge of shoulder-girdle and axis of pectoral darkish golden brown; iris silvery, anterior and posterior edges golden brown, upper edge dark blue, lower edge pale silvery blue; spinous dorsal dark ashy gray, the spines dirty greenish yellow, margin blackish; soft dorsal darkish; caudal dark gray, edges blackish, base and root with silvery reflections; anal silvery, margin darkish; ventrals pale, darkish silvery, margin blackish, inner side with dark brownish streak along the rays; pectoral silvery, margin pale, upper edge blackish, inner side burnt ochre or blackish brown.

Color in alcohol, brownish olivaceous becoming lighter below, the posterior edge of each scale being darker; dorsal slightly darker than the body, edge darker; caudal and anal similar to dorsal; pectoral palish brown; ventrals brownish, tips darker on lower side, the front of rays scaled, the scales being white, speckled with brown.

The above description based chiefly upon a specimen (No. 03012) 17.5 inches long, from Honolulu, where we obtained 5 specimens 11 to 23 inches long. The species was also taken by the *Albatross* at Laysan Island. It attains a length of 1 to 2 feet and is a good food-fish.

On comparison of our specimens with *Kyphosus elegans* from Mazatlan, we find very little difference, and we adopt *Kyphosus sandwicensis* as a distinct species only provisionally.

? *Pimblepterus elegans* Peters, Berliner Monatsberichte, K. Preuss., Ak. Wiss., 707, 1869, Mazatlan.

Pimblepterus sandwicensis Sauvage, Bull. Soc. Philom., III-IV, 1878-80 (July, 1880), Honolulu.

Kyphosus elegans, Evermann & Jenkins, Proc. U. S. Nat. Mus. 1891, 155 (Guaymas); Jordan & Evermann, Fish. North & Mid. Amer. II, 1387, 1898; Jordan & Evermann, Amer. Food and Game Fishes, 453, 1902; Jenkins, Bull. U. S. Fish Comm., XXII, 1902 (Sept. 23, 1903), 453 (Honolulu); Snyder, Bull. U. S. Fish Comm., XXII, 1902 (Jan. 19, 1904), 527 (Laysan Island).

189. *Kyphosus fuscus* (Lacépède). "*Manaloo*;" "*Nenuc*."

Head 3.5 in length; depth 2.4; eye 4 in head; snout 3.1; maxillary 3.5; interorbital 2.6; D. xi, 12; A. iii, 11; scales 12-82-21, about 70 in series just below lateral line.

Body oblong, deep, compressed, dorsal outline more convex than ventral, the latter being nearly straight from origin of anal to before base of ventrals; dorsal outline from origin of dorsal to tip of snout nearly evenly arched, becoming slightly steeper over snout, the prominence in front of eye not very evident; head deeper than long, compressed, much broader through the middle; snout very short, bluntly conic; mouth small, horizontal, upper jaw slightly the longer, maxillary reaching slightly beyond anterior edge of eye; a single row of moderately broad and strong incisor teeth on each jaw, their roots with very conspicuous backward parallel prolongations; no villiform teeth back of these evident; bands of villiform teeth on vomer and palatines; eye entirely above axis of pectoral, anterior; preopercle entire; interorbital broad and convex; caudal peduncle 1.8 in head; origin of dorsal slightly in advance of origin of ventrals; distance of origin of dorsal from tip of snout equal to depth of body; dorsal spines moderately strong, longest spines much higher than soft dorsal, 2.2 in head, first spine two-thirds as high as second; caudal broad, not deeply forked, its lobes broad and equal, their length, measured from the first supporting ray to tip, slightly longer than head; anal similar to soft dorsal, its base equal to that of soft dorsal, about 1.25 in head; pectoral rather broadly rounded, 1.6 in head, not reaching ventrals; ventrals not reaching vent, shaped like pectoral, 1.6 in head; scales rather small, weakly ctenoid, much deeper than long, larger on side of body; entire body and snout scaled, except anterior part of snout; scales on head small, small scales on entire soft dorsal, anal and caudal fins and most of pectoral and ventrals, a large humeral scale on which is a patch of smaller scales; lateral line concurrent with dorsal outline.

Color in alcohol, grayish brown, with bluish silvery reflections, becoming lighter below, almost white on belly, narrow, dark bands on the side between the rows of scales, a narrow silvery band under eye; snout dark brown, membrane of spinous dorsal with some brownish; soft dorsal, anal and pectoral color of body; caudal brownish olivaceous, tips lighter; ventral membranes purplish brown, rays lighter.

The above description based chiefly upon a specimen (No. 04480) 8.75 inches long, from Honolulu. This fish reaches about a foot in length and is valued as a food-fish. It was obtained only at Honolulu, whence we have 4 good specimens 5 to 9 inches long.

Xyster fuscus Lacépède, Hist. Nat. Poiss., v, 484, 1803, Red Sea.

Pimelepterus fuscus, Günther, Cat., i, 498, 1859 (Red Sea); Steindachner, Denks. Ak. Wiss. Wien, LXX, 1900, 489 (Honolulu and Laysan).

Genus 138. *SECTATOR* Jordan & Fesler.

This genus is very close to *Kyphosus*, from which it differs in its smaller incisor teeth, which have very inconspicuous roots, and in the deeply forked caudal.

Only 2 species known—*Sectator ocyurus* from Panama and *S. azureus* from Oahu.

Sectator Jordan & Fesler, Review Sparoid Fishes, Rept. U. S. Fish Comm. 1889-1891 (1893), 534 (*ocyurus*).

190. *Sectator azureus* Jordan & Evermann. Plate XX.

Head 4 in length; depth 3; eye 5 in head; snout 3.65; maxillary 4; interorbital 2.4; D. xi, 15; A. iii, 13; scales 14-81-20.

Body elongate, ovoid, greatest depth about at tip of pectoral; head slightly longer than deep, compressed; snout very bluntly convex; jaws about equal, maxillary not reaching front of eye; mouth small, horizontal; teeth very small, compressed, in a single series in each jaw; minute villiform teeth on vomer, palatines and tongue; tongue broad, rounded and free in front; preopercle entire, posterior edge very oblique; lower edge of eye on a line with upper base of pectoral, posterior margin well in front of middle of head; interorbital broad, strongly convex, a deep groove in front of eye to nostril; caudal peduncle rather long, 1.9 in head; origin of spinous dorsal slightly in front of base of ventrals, well behind pectoral, its distance from tip of snout slightly greater than depth of body; longest dorsal spine 3 in head, last dorsal ray elongate, being one-fourth longer than other rays, its length 3.4 in head; third anal spine longest, 4.9 in head; first anal ray longest, 3.4 in head; base of anal 1.8 in base of dorsal; caudal deeply forked, lower lobe the longer, 3.5 in body; pectoral short, slightly longer than ventrals,

1.8 in head, the spine more than half length of longest ray; scales cycloid, present on head except on jaws and in front of eye, very minute on all the fins except ventrals; lateral line concurrent with dorsal outline; peritoneum dark gray.

Color in life, dark steel-blue, becoming paler below; a definite deep blue stripe from snout below eye widening on opercle, and thence straight to center of base of caudal; below it a narrow bright golden stripe from angle of mouth to lower part of caudal, and then a fainter blue stripe below this; a blue stripe from eye to upper part of gill-opening, interspace golden shaded with green; a deep blue stripe, not sharply defined, from upper part of eye along each side of back to base of upper caudal lobe; upper fins dusky golden or olivaceous; ventrals yellow; anal and lower lobe of caudal dirty golden; pectoral translucent.

Color in alcohol, deep steel-gray, brown above, each scale with a very pale spot, the edge pale, lower surface whitish silvery; a pale streak of gray behind eye to edge of opercle; dorsal fin gray-brown like the back; caudal and pectoral whitish; inside of ventrals dusky orange; ventrals and anal dusky; inside of pectoral blackish brown.

Type, No. 50664, U. S. Nat. Mus. (field No. 03363), a specimen 15.25 inches long, taken off the shore near Heeia, Oahu Island.

This species must be very rare, being unknown to the fishermen and only the single specimen having been obtained by us.

Sectator azureus Jordan & Evermann, Bull. U. S. Fish Comm., XXII, 1902 (Apr. 11, 1903), 185, Heeia, Oahu Island.

Family LXVI. MULLIDÆ.—The Surmulletts.

Body elongate, slightly compressed, covered with large scales which are usually slightly ctenoid; lateral line continuous, the pores often branched; large scales on the head; upper profile of head more or less parabolic; mouth small, low, subterminal; teeth mostly small, variously placed; no canines, incisors, nor molars; premaxillaries somewhat protractile; maxillaries thin, nearly as broad at base as at tip, without supplemental bone, partly hidden by the broad preorbital; preopercle entire or slightly serrate; opercle unarmed or with a single spine; eye moderate, placed high; branchiostegals 4; pseudobranchiæ present; 2 long, unbranched barbels at the throat, attached just behind the symphysis of the lower jaw; dorsal fins 2, remote from each other, both short, the first of 6 to 8 rather high spines, which are depressible in a groove; anal short, similar to the soft dorsal, with 1 or 2 small spines; ventrals thoracic 1, 5; air-bladder usually present, simple; vertebrae 9+14=23; stomach siphonal; pyloric cæca about 20. Species about 40, referable to 5 closely related genera, found in all tropical seas, some species straying northward. Many of the species are highly valued as food, especially the European *Mullus barbatus* and *Mullus surmuletus*.

a. No teeth on vomer and palatines.

b. Teeth of jaws small, subequal, in several series or narrow villiform bands *Mulloides*, p. 249

bb. Teeth of the jaws rather strong, unequal, in 1 or 2 series *Pseudupeneus*, p. 254

aa. Teeth on vomer and palatines, and in both jaws *Upeneus*, p. 264

Genus 139. MULLOIDES Bleeker.

This genus differs from *Upeneus* only in the dentition, the teeth in both jaws being in narrow villiform bands, none on vomer or palatines. Species numerous, chiefly of the Pacific Ocean.

Mulloides Bleeker, Percoiden, Sept., 1848, in Verh. Bat. Gen., XXII, 1849 (*flavotinctus*).

Mulloides Bleeker, Nat. Tijds. Ned. Ind., III, 697, 1852 (*flavotinctus*).

a. Scales in lateral line 40 or more (40 to 43).

b. Eye comparatively large, 3.33 to 3.5 in head.

c. Eye 3.5 in head; scales 40; no yellow lines on head *auriflamma*, p. 250

cc. Eye 3.33 in head; scales 42 or 43; yellow lines on head *erythrinus*, p. 251

bb. Eye smaller, 4 to 6 in head.

d. Eye very small, 6 in head; snout rather long, 1.9 in head *plugeti*, p. 251

dd. Eye larger, 4.3 in head; snout shorter, 2.25 in head *flammeus*, p. 251

aa. Scales in lateral line fewer than 40 (31 to 37).

c. Body comparatively slender, depth about 4 in length, head 3.5; scales 35 *samoensis*, p. 253

cc. Body deeper, depth about 3 in length; head longer, 3 in length; scales 31 *vaticolensis*, p. 254

191. *Mulloides auriflamma* (Forskål). "Weke," "Weke ula." Fig. 103.

Head 3.6 in length; depth 3.6; eye 3.5 in head; snout 3.1; interorbital 3; maxillary 3; shortest distance between maxillary and eye 1.67 in longitudinal diameter of eye; D. VII-9, longest dorsal spine 1.4 in head; A. 7, longest anal ray 2 in head; scales 3-40-6, 42 pores; gillrakers 24 + 8, the longest 2.5 in eye, serrate, those on longer limb becoming short and blunt.

Body oblong, compressed, deepest through anterior base of spinous dorsal; head moderate, compressed, its upper profile not straight, the line being slightly concave above eyes, the part anterior to nostrils rather steep; snout blunt; lower jaw slightly included; mouth rather small but oblique; tongue short, rounded anteriorly, not broad, thick, nor free anteriorly; teeth in a villiform band in each jaw; maxillary 1.3 in snout, not quite reaching anterior edge of orbit, rather large, covered anteriorly by a sheath; eye moderate, high, median; adipose eyelid slight, not nearly halfway to pupil anteriorly; barbels reaching to posterior edge of preopercle; pseudobranchia well developed; spinous dorsal high, its posterior edge nearly truncate, its base equal to longest spine, distance from anterior base to tip of snout equaling distance from anterior base across body to anterior base of anal; soft dorsal slightly concave; caudal deeply forked; anal similar to soft dorsal, inserted slightly behind it; ventrals

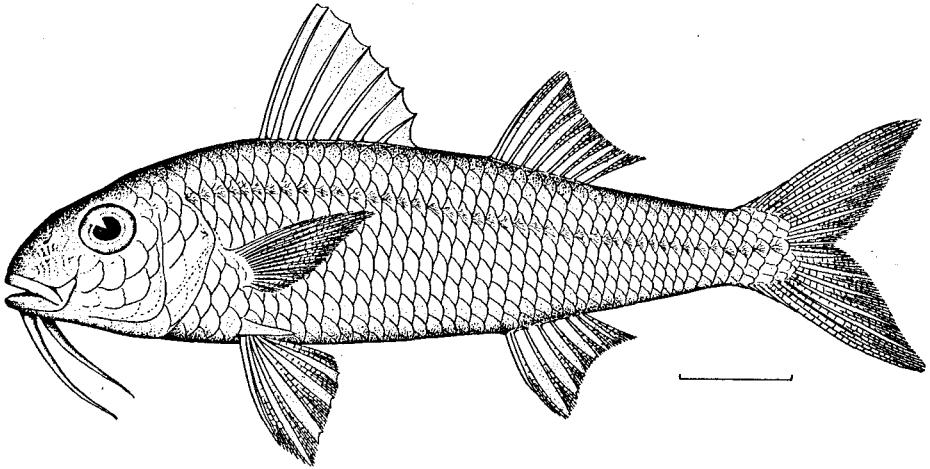


FIG. 103.—*Mulloides auriflamma* (Forskål).

reaching slightly beyond pectoral, the rays equal in length, and equal to longest dorsal spine; lateral line concurrent with the back; scales large, slightly ctenoid; entire body and head scaly.

Color in life, upper half of head, nape and back rosy red, richest on head; lower half of head white with very light rosy wash; side with a pale yellow band a scale wide, from eye to base of caudal, most distinct anteriorly; lower two-thirds of side white, with a light rosy wash; fins all pale rosy, except pectoral, which has a slight lemon-yellow wash; iris white with narrow inner rosy ring. Color in alcohol, dusky gray, fins all pale, except slight indications of black on upper posterior edge of dorsal spines. This description based chiefly on No. 02986, an example 8.5 inches long, from Honolulu.

Another specimen, No. 03479, from Hilo, had in life back violet red with some slight yellowish edging to scales; a broad yellow stripe from eye to base of caudal; a yellow streak horizontally below eye; lower part of side pale rosy; barbels white; fins all light orange, rosy and golden shaded, without marking; first dorsal darkest; iris red.

The collection contains 8 other examples from Honolulu and 4 from Hilo. We have also examined a specimen 10 inches long, collected by Dr. Jenkins at Honolulu, and others obtained at that place by the *Albatross*.

This fish is rather common in the market of Honolulu, being taken inside the reef. The 28 specimens we have are 3.25 to 14 inches long.